H. L. Hardy, Greer.

THE PRINCIPLES OF GYNAECOLOGY

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OF

GYNAECOLOGY

BY

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WITH 6 COLOURED PLATES
AND 357 ILLUSTRATIONS IN THE TEXT

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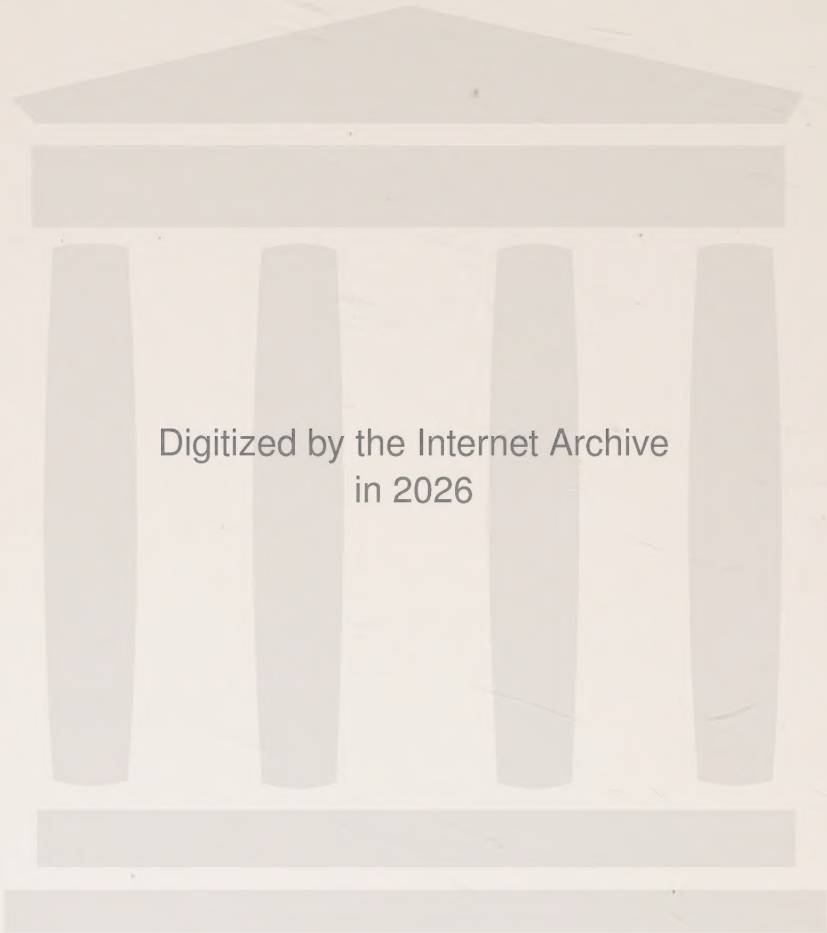
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THIS BOOK IS GRATEFULLY

DEDICATED

TO THOSE OF MY FRIENDS WHO BY THEIR CONFIDENCE,

KINDLY INTEREST AND APPRECIATION HAVE

DONE SO MUCH TO ENCOURAGE ME

IN MY WORK.

PREFACE.

This small work on the *Principles of Gynaecology* has been undertaken with the object of presenting to the general practitioner and student, if possible in an interesting and palatable form, a complete and modern survey of the foundations on which gynaecology is established.

Although I have endeavoured to treat the subject scientifically, I have at the same time tried to do so simply; for I do not believe that obscurity of expression and complexity of detail and arrangement are necessary attributes of any treatise, however learned.

In order to carry out my purpose I have been obliged to cast aside the recognized method—time-worn and too long honoured—of gynaecological compilation, and to adopt a simpler and more logical arrangement, which I think will make for greater lucidity as well as for more consecutive reading. I make no claim to having been successful in all that I set out to accomplish, for I have been continually impressed with the great difficulty of dealing in a cohesive and at the same time coherent manner with a subject which has so many ramifications, and is so riddled with inherited inaccuracies. I have endeavoured to avoid the latter, but I am well aware that I, too, may have perpetuated unwittingly and in ignorance what others will hold up to ridicule.

While attempting to be as complete as possible in a limited space, I have laid stress on those conditions which are most likely to cause the general practitioner difficulty in his daily work, and I have gauged these by my own difficulties in the past.

The consideration of operative procedures, which naturally fall more especially to the gynaecologist, is confined to a brief *résumé* of the essential principles and details of the chief methods employed in uncomplicated cases. The preparation of the patient and the after-treatment, with which everyone should be familiar, have been dealt with at greater length. Likewise I have tried to meet the needs of

the student by dealing somewhat fully with the scientific side of the subject. Of the morbid histology, which plays such an important part in gynaecological diagnosis, there will be found many photomicrographic illustrations, without which no pathological description is adequate. For the sake of convenience in the study of these, and in order to avoid repetition and not to overburden the text, I have thought it advisable to append a detailed description to each.

The appendix of classified causes of certain common symptoms is intended for the student to revise his knowledge, and to afford the practitioner some assistance in making a diagnosis by the process of exclusion.

It is necessary to add that I have purposely avoided as much as possible the use of proper names; and somewhat diffidently I have omitted all references, in the belief that they are not required by those for whom this book is intended. Further, in order to keep within a reasonable compass, I have for the most part expressed my own views and the results of my own work and experience, and have avoided adducing a series of comparative suggestions and opinions which are liable to place the student in the position of Buridan's famous quadruped. I have preferred to put before the reader the data, and to indicate the lines of treatment as they appear to me to follow common sense and modern knowledge.

I have to express my grateful recognition of the kindness of my old teacher Mr. F. F. Burghard, whose encouragement and advice in regard to details of publication have been of the greatest assistance to me; also of the help afforded in the revision of the text and correction of the proofs by my friends Dr. Hubert Armstrong, Dr. Pantland Hick and Dr. Eardley Holland, to all of whom I am indebted for valuable suggestions. Dr. Armstrong was also good enough to take for me some excellent photographs which appear among the general illustrations.

Most of the sections from which I prepared the photomicrographs were cut in the pathological department in the University of Liverpool, under the superintendence of Dr. E. E. Glynn. In justice to these it is to be regretted that a photomicrograph is never so good as the original, and, further, that in the reproduction of the photograph much detail is also inevitably lost. In spite of this I have preferred to use untouched photographs rather than to have drawings made. The photomicrographs of bacteria were kindly taken for me by Dr. Glynn.

Dr. T. B. Grimsdale, Dr. Nathan Raw and those in charge of the gynaecological museum in the University of Liverpool I have to thank for the loan of specimens and sections. Mr. R. Favell, too, was good enough to lend me a section of a tumour removed by him.

Appendix I., on electrotherapeutics, was kindly written for me by Dr. Curtis Webb. I alone am responsible for its brevity and incompleteness.

The labour of preparing the illustrations has been greatly lightened by the skill and patience of Mr. A. K. Maxwell and Sig. Censi. Nearly all the original pictures (apart from the diagrams) were drawn from nature.

To several authors and publishers I am indebted for having allowed me to reproduce or modify their illustrations; an acknowledgement is made in connexion with the respective figures. Several firms of makers have also kindly provided me with the blocks to illustrate their instruments which are figured in the text.

Lastly I wish to offer my best thanks to my publishers, who have made a pleasure of what might otherwise have been a burden, not only by their courtesy, advice and assistance, but also by their generosity in meeting my every wish in regard to the illustrations and other details of publication.

W. BLAIR BELL.

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CONTENTS.

CHAPTER I.

THE EVOLUTION AND DEVELOPMENT OF THE FEMALE GENITAL ORGANS.

SECTION		PAGE
i.	The evolution of the female genital organs	1
ii.	The development of the female genital organs	9

CHAPTER II.

THE ANATOMY OF THE FEMALE GENITAL ORGANS.

i.	General naked-eye appearances and relations	23
ii.	The bony pelvis; the muscles and fasciae	30
iii.	Macroscopical and microscopical anatomy	36
iv.	The blood, lymphatic and nervous supply	61

CHAPTER III.

THE PHYSIOLOGY OF THE FEMALE GENITAL ORGANS.

i.	The normal secretions of the genital organs	66
ii.	The menstrual function	67
iii.	The physiology of conception and reproduction	77
iv.	Lactation	85
v.	Uterine contractions	86
vi.	The menopause	87

CHAPTER IV.

CASE-TAKING AND THE EXAMINATION OF THE PATIENT.

i.	Case-taking	92
ii.	Examination of the patient	95

CHAPTER V.

CONGENITAL DERANGEMENTS OF THE NORMAL ANATOMICAL CONDITIONS (MALFORMATIONS).

SECTION		PAGE
i.	Abnormalities of the ovaries	117
ii.	Abnormalities of the Fallopian tubes, uterus and vagina	118
iii.	Abnormalities of the vulva	127
iv.	Abnormalities due to defects in the partition of the cloaca and urogenital sinus	128
v.	Hermaphroditism and pseudohermaphroditism	129

CHAPTER VI.

ACQUIRED DERANGEMENTS OF THE NORMAL ANATOMICAL CONDITIONS: INJURIES.

i.	Injuries to the vulva and vagina	132
ii.	Injuries to the vagina and uterus	137
iii.	Injuries to the Fallopian tubes and ovaries	146

CHAPTER VII.

ACQUIRED DERANGEMENTS OF THE NORMAL ANATOMICAL CONDITIONS: DISPLACEMENTS.

i.	Displacements of the ovaries and Fallopian tubes	147
ii.	Displacements, flexions and versions of the uterus	148

CHAPTER VIII.

DISORDERS OF THE NORMAL PHYSIOLOGICAL CONDITIONS IN RELATION TO MENSTRUATION.

i.	Affections of puberty	191
ii.	Amenorrhoea	193
iii.	Menorrhagia	199
iv.	Dysmenorrhoea	202
v.	Other disorders associated with menstruation	209
vi.	Disorders of the menopause	211

CHAPTER IX.

DISORDERS OF THE NORMAL PHYSIOLOGICAL CONDITIONS IN RELATION TO CONCEPTION.

SECTION		PAGE
i.	Sterility	216
ii.	Dyspareunia	218
iii.	Abortion	220
iv.	Subinvolution	226
v.	Superinvolution	227
vi.	Oedema and varicose veins of the vulva	228
vii.	Ectopic pregnancy	228
viii.	Uterine moles	236

CHAPTER X.

INFECTIVE AND PARASITIC DISEASES OF THE GENITAL TRACT.

i.	Normal bacteriological conditions	241
ii.	Gonorrhoea	242
iii.	Syphilis	258
iv.	Soft sore	262
v.	Septic infection (Staphylococcus and streptococcus)	262
vi.	Septic infection (Bacillus coli communis)	273
vii.	Septic infection (Pneumococcus)	274
viii.	Tuberculosis	275
ix.	Gas-forming infection	279
x.	Diphtheria	279
xi.	Tetanus	280
xii.	Typhoid infection	280
xiii.	Elephantiasis Arabum	281
xiv.	Actinomycosis	281
xv.	Hydatid disease	282

CHAPTER XI.

RETENTION AND EFFUSION CYSTS OF THE GENITAL TRACT.

i.	Cysts of the vulva	283
ii.	Cysts of the vagina	285
iii.	Cysts of the uterus	288
iv.	Cysts of the broad ligaments	289

SECTION PAGE
v. Cysts of the ovaries 292
vi. Tubo-ovarian cysts 293

CHAPTER XII.

INNOCENT NEOPLASMS OF THE GENITAL TRACT.

i. Of the vulva 296
ii. Of the vagina 300
iii. Of the uterus 300
iv. Of the round ligaments 330
v. Of the Fallopian tubes 331
vi. Of the broad ligaments 332
vii. Of the ovaries 334

CHAPTER XIII.

MALIGNANT NEOPLASMS OF THE GENITAL TRACT.

i. Of the vulva 354
ii. Of the vagina 360
iii. Of the uterus 361
iv. Of the Fallopian tubes 384
v. Of the ovaries 386

CHAPTER XIV.

ALLIED MORBID CONDITIONS.

i. General diseases 392
ii. Local diseases: Pelvic, abdominal and vulval 398

CHAPTER XV.

THE PREPARATIONS FOR OPERATION, AND THE SUBSEQUENT MANAGEMENT OF THE CASE.

i. Choice and preparation of the room 414
ii. Requisites to be prepared by the nurse 414
iii. General preparation of the patient for operation 415
iv. Anaesthesia 417

SECTION PAGE

v. The preparation of the patient for an abdominal operation and her after-treatment 419

vi. The preparation of the patient for a vaginal operation and her after-treatment 421

vii. Postoperative complications and their management 422

viii. The administration of saline infusions 435

CHAPTER XVI.

THE MAIN PRINCIPLES OF GYNAECOLOGICAL OPERATIONS, WITH SOME DETAILS OF THEIR TECHNIQUE.

i. The surgeon's preparations 439

ii. Abdominal operations. General considerations. The abdominal incision and the closure of it. Abdominal hysterectomy. Myomectomy. Hysteropexy. Operations on the ligaments of the uterus. Abdominal Caesarean section. Oöphorectomy. Resection of the ovary. Removal of parovarian and other broad ligament cysts. Salpingectomy 445

iii. Vulval and vaginal operations. General considerations. Operations on the vulva: excision of Bartholin's duct and gland; excision of vulval growths; removal of urethral caruncles. Operations on the vagina: perineorrhaphy; colporrhaphy; repair of fistulae; removal of cysts and growths. Vaginal operations on the uterus: trachelorrhaphy; for congenital stenosis of the cervix; amputation of the vaginal cervix; dilatation of the cervix; curettement of the uterus; removal of uterine polypi and cervical fibromyomata; hysterotomy. Vaginal hysterectomy. Colpotomy 474

APPENDIX I.

ELECTROTHERAPEUTICS IN GYNAECOLOGY 510

APPENDIX II.

CLASSIFICATION OF THE CAUSES OF CERTAIN SYMPTOMS.

i. Haemorrhage 515

ii. Amenorrhoea 517

iii. Dysmenorrhoea 518

iv. Pathological discharges 519

v. Pruritus vulvae 521

vi. Dysuria 521

vii. Sterility 522

INDEX 524

LIST OF ILLUSTRATIONS.

COLOURED PLATES.

PLATE	FIG.		FACING PAGE
I.	116.	Laceration of cervix uteri	139
II.	172.	Acute gonorrhoeal infection of cervix uteri	246
III.	173.	Chronic cervicitis	247
IV.	186.	Primary chancre on the vulva	258
V.	187.	Condylomata on the vulva	259
VI.	215.	'Erosion' of cervix	301

OTHER ILLUSTRATIONS.

FIG.		PAGE
1.	Reproductive organs in the female lamprey	2
2.	Female reproductive organs in the herring	2
3.	Female reproductive organs in the frog	3
4.	Genital passages in the female salamander	4
5.	Female reproductive organs in the snake (viper)	4
6.	Female reproductive organs in the platypus (ornithorhynchus)	5
7.	Female reproductive organs in the phalanger	7
8.	Female reproductive organs in the opossum	7
9.	Evolution of the bicornuate uterus	8
10.	Origin of the intermediate cell mass in human embryo	9
11.	Relations of the urogenital organs about the fourth week	10
12.	Relations of derivatives from intermediate cell mass	10
13.	Section of 'germinal' epithelium in chick	11
14.	Section of ovary of young bitch (*Photomicrograph*)	12
15.	Section of ovary from young rabbit (*Photomicrograph*)	13
16.	Formation of genital cord at tenth week	14
17.	Fate of the Wolffian duct and tubules in woman	15
18.	'Descent' of the genital organs, and crossing of genital and Wolffian mesenteries	16
19.	Section through uterine cornu and broad ligament of rabbit (*Photomicrograph*)	18

FIG.		PAGE
20.	Early disposition of mesenteries and action of subperitoneal muscular fibres	19
21.	Normal methods of development of vagina	20
22.	Fate of urogenital sinus in the absence of uterus	21
23.	The cloacal membrane and its relation to the urogenital sinus	22
24.	Development of the external genitals in the female	22
25.	External genitals in the virgin	24
26.	Varieties and modifications of the hymen	25
27.	The interior of the vagina	27
28.	Position and relations of the female genital organs in the pelvis	28
29.	View of the pelvis with the uterus pulled forwards	29
30.	The bony pelvis and its ligaments	30
31.	Dissection of the muscles of the female perineum	31
32.	Attachments of sheaths of levator ani to pelvic aponeurosis of compressor urethrae	32
33.	Deep dissection of the perineal region	33
34.	Pelvic aspect of levator ani and its aponeurosis	34
35.	Relations of the 'pelvic fascia' to the viscera	35
36.	Posterior view of uterus and appendages	37
37.	Section of adult human ovary (*Photomicrograph*)	38
38A.	Section showing ripening of the Graafian follicle (*Photomicrograph*)	39
38B.	Section showing ripe Graafian follicle (*Photomicrograph*)	39
39A.	Section showing first stage in formation of corpus luteum (*Photomicrograph*)	41
39B.	Section showing second stage of corpus luteum (*Photomicrograph*)	41
40A.	Section showing third stage of corpus luteum (*Photomicrograph*)	42
40B.	Section showing third and fourth stages of corpus luteum (*Photomicrograph*)	42
41.	Sections of normal Fallopian tube (*Photomicrographs*)	43
42.	Lateral vertical section through multiparous uterus	44
43.	Section of involuntary muscle of uterus (*Photomicrograph*)	45
44.	Disposition of the muscle fibres in the uterus	46
45A.	Normal endometrium in vertical section (*Photomicrograph*)	48
45B.	Normal endometrium in cross section (*Photomicrograph*)	48
46.	Section of cervix uteri (*Photomicrograph*)	49
47A.	Uterus and appendages from a child aged 18 months	50
47B.	Uterus and appendages from a nullipara aged 22 years	50
47C.	Senile uterus with appendages	50
48.	Section of uterus from a child aged 18 months (*Photomicrograph*)	51
49.	Relations of ureter and uterine artery in broad ligament	52
50.	Section of the round ligament (*Photomicrograph*)	53

FIG. PAGE

51. Posterior view of uterus and appendages, with Wolffian remains . 54
52. Dissection of posterior abdominal wall and pelvis 55
53. Sectional view of vaginal canal 56
54. Section through adjacent walls of vagina and rectum (*Photomicrograph*) 56
55. Section through adjacent walls of vagina and bladder (*Photomicrograph*) 57
56. Section of the hymen (*Photomicrograph*) 58
57. Section of the labium minus (*Photomicrograph*) 58
58. Section of the labium majus (*Photomicrograph*) 59
59. Section through the clitoris (*Photomicrograph*) 59
60. Dissection of perineum showing bulbus vestibuli 60
61. Terminal branches of Bartholin's gland 60
62. Arteries of the internal genital organs in the female 62
63. Lymphatics connected with the female genital organs 64
64. Section of endometrium in the premenstrual stage (*Photomicrograph*) 72
65. Section of endometrium during menstruation (*Photomicrograph*) . 72
66. Section showing stroma of endometrium during premenstrual stage (*Photomicrograph*) 73
67. Section of endometrium of rabbit during menstruation (*Photomicrograph*) 74
68. Section showing leucocytes passing into lumen of glands during menstruation (*Photomicrograph*) 74
69. Section showing formation of lacunae during menstruation (*Photomicrograph*) 75
70. Section showing removal of superficial endometrium by menstrual haemorrhage (*Photomicrograph*) 75
71. Section showing endometrium during menstruation, showing formation of lacuna (Rabbit), (*Photomicrograph*) 76
72. Implantation of human ovum 80
73. Section of chorionic villus from an early ovum 81
74. Average position of fundus uteri at different periods of pregnancy (*Photograph*) 82
75. Method of obtaining Hegar's sign 84
76. Section of senile ovary (*Photomicrograph*) 88
77. Section of senile Fallopian tube (*Photomicrograph*) 89
78A. Section of endometrium and muscle wall of senile uterus (*Photomicrograph*) 90
78B. Section of endometrium of senile uterus (*Photomicrograph*) . . . 90
79A. Card for recording notes of case 93
79B. Back view of same card 93
80. Surface markings of abdominal areas (*Photograph*) 98
81. Relations of pelvic and abdominal contents to the abdominal areas . 99
82. Contour of abdomen with large ovarian or parovarian tumour . . 100

FIG.		PAGE
83.	Contour of abdomen with large fibromyomatous uterus	100
84.	Area of cutaneous hyperaesthesia associated with the ovary	102
85.	Area of cutaneous hyperaesthesia associated with the Fallopian tube	102
86.	Areas of cutaneous hyperaesthesia associated with the cervix uteri.	103
87.	Areas of cutaneous hyperaesthesia associated with the uterus	103
88.	Method of obtaining the physical sign of 'dipping'	104
89.	Dulness of anterior abdominal wall with an ovarian cyst (*Photograph*)	105
90.	Section through abdomen to illustrate the physical signs with an ovarian cyst	105
91.	Dulness of abdominal wall with ascites (*Photograph*)	106
92.	Section through abdomen to illustrate the physical signs with ascites	106
93.	Sims' latero-prone position (*Photograph*)	108
94.	Sims' speculum	109
95.	Cusco's bivalve speculum	109
96.	Fergusson's speculum	109
97.	Electrically illuminated Sims' speculum	109
98.	Method of inserting Sims' speculum (*Photograph*)	110
99.	Examination of patient in modified dorsal position (*Photograph*)	111
100.	Method of bimanual palpation in left latero-prone position	112
101.	Uterine sound	114
102.	Light volsellum forceps	114
103.	The genufacial position (*Photograph*)	115
104.	Anaesthetized patient fixed in the genufacial position	116
105.	Fallopian tube with accessory ostium	119
106.	Congenital stenosis of external os uteri and small conical cervix	119
107.	Results of imperfect fusion of uterine portions of Müllerian ducts	121
108.	Septate conditions of vagina and uterus	123
109.	Imperforate vagina	124
110.	Menstrual retention in atresia of vagina and cervix uteri	125
111.	Menstrual retention with a divided condition of uterus and vagina	126
112.	Diagrammatic representation of hypospadias	129
113.	Incomplete laceration of the perineum	134
114.	Complete laceration of the perineum	135
115.	Central laceration of the perineum	136
117.	Laceration of the uterus	142
118.	Cast of vaginal epithelium caused by use of strong chemicals in the vagina	144
119.	Cast of vaginal epithelium showing histological appearance	144
120.	The common forms of fistulae in connexion with the genital passages	145
121.	Anterior derangements of the uterus	150

FIG.		PAGE
122.	Retroflexed uterus with fibromyoma on anterior wall	151
123.	Posterior derangements of the uterus	152
124.	Albert Smith pessary (*Photograph*)	154
125.	Hodge pessary (*Photograph*)	154
126.	Section of oedematous endometrium from a case of retroflexion (*Photomicrograph*)	156
127.	Method of holding Albert Smith or Hodge pessary during insertion through vulva (*Photograph*)	160
128.	Method of forcing Albert Smith or Hodge pessary into position (*Photograph*)	160
129.	Insertion of the Albert Smith or Hodge pessary; first stage (*Photograph*)	161
130.	Position and mode of action of Hodge or Albert Smith pessary after insertion	162
131.	Sectional view of pelvis with douche apparatus *in situ*. (Inset illustration of apparatus)	163
132.	Lateral derangements of the uterus viewed from the front	166
133.	Lateral versions	167
134.	Vertical derangements of the uterus	168
135.	Ovarian cyst impacted in Douglas' pouch	169
136.	The various degrees of prolapse	171
137.	Complete prolapse (procidentia) of the uterus	173
138.	Anatomical relationships in complete procidentia	174
139.	Author's supported ring pessary for procidentia	177
140.	Rubber ring pessary (*Photograph*)	179
141.	Method of holding ring pessary during insertion through vulva (*Photograph*)	180
142.	Method of forcing ring pessary into position (*Photograph*)	180
143.	Insertion of rubber ring pessary; first stage (*Photograph*)	181
144.	Manner and degrees of inversion of the uterus	184
145.	Inversion of the uterus	185
146.	Barnes' hydrostatic bags	187
147.	Champetier de Ribes' hydrostatic bag	188
148.	Aveling's repositor	189
149.	Partial inversion of uterus caused by traction on a submucous fibromyoma during removal	190
150.	Section of human uterus four years after double oöphorectomy (*Photomicrograph*)	196
151.	Cast from a case of exfoliative dysmenorrhoea	205
152.	Low power view of section of a cast from a case of exfoliative dysmenorrhoea (*Photomicrograph*)	207
153.	High power view of section of a similar cast (*Photomicrograph*)	207

FIG.		PAGE
154.	Section showing haemorrhages in endometrium at menopause (*Photomicrograph*)	213
155.	Section of kraurosis vulvae (*Photomicrograph*)	215
156.	Vaginal dilator	219
157.	Early ovum in its chorionic coat	223
158.	Decidual cast containing an ovum	223
159.	Section showing decidual cells in early pregnancy (*Photomicrograph*)	225
160.	Section showing placental remains removed from uterus by curetting (*Photomicrograph*)	225
161.	Sites at which implantation of ovum may occur	228
162.	Extrauterine pregnancy; tubal abortion	231
163.	Section through Fallopian tube showing tubal mole and ovum *in situ*	232
164A.	Section through tubal mole (*Photomicrograph*)	233
164B.	Section showing chorionic villi in blood clot from a tubal mole (*Photomicrograph*)	233
165.	Decidual uterine cast from a case of ectopic pregnancy	234
166.	Carneous, or blood mole	237
167.	Complete hydatidiform mole (*Photograph*)	238
168.	Incomplete hydatidiform mole (*Photograph*)	238
169A.	Histological appearance of villus of hydatidiform mole	239
169B.	Section of wall of hydatidiform vesicle (*Photomicrograph*)	239
170.	Gonococcus (*Photomicrograph*)	243
171.	Section showing acute inflammation of Bartholin's gland (*Photomicrograph*)	246
174.	Section showing chronic endometritis (*Photomicrograph*)	247
175.	Section showing acute salpingitis (*Photomicrograph*)	248
176.	Section showing closure of abdominal ostium of Fallopian tube subsequent to salpingitis (*Photomicrograph*)	249
177.	Double hydrosalpinx	250
178.	Section of hydrosalpinx (*Photomicrograph*)	250
179.	Pyosalpinx with abscess in the ovary	251
180.	Section showing acute salpingitis (*Photomicrograph*)	252
181.	Section showing acute salpingitis; late stage (*Photomicrograph*)	252
182.	Section showing acute oöphoritis (*Photomicrograph*)	253
183.	Section showing chronic interstitial oöphoritis	254
184.	Playfair's probe	256
185.	Spirochaeta pallida (*Photomicrographs*)	258
188.	False elephantiasis of vulva	260
189.	Ducrey's bacillus (*Photomicrograph*)	262
190.	Staphylococcus pyogenes (*Photomicrograph*)	263
191.	Streptococcus pyogenes (*Photomicrograph*)	263

FIG. PAGE

192. Section showing acute inflammation of the endometrium (*Photomicrograph*) 265
193. Section of thrombosed ovarian vein (*Photomicrograph*) . . . 271
194. Bacillus coli communis (*Photomicrograph*) 273
195. Bacillus tuberculosus (*Photomicrograph*) 275
196. Tuberculous uterus and Fallopian tubes 276
197. Tuberculosis of Fallopian tubes 277
198. Section showing tuberculous salpingitis (*Photomicrograph*) . . 278
199. Bacillus aërogenes capsulatus (*Photomicrograph*) 279
200. Cyst of duct of Bartholin's gland 284
201. Positions in which cysts may occur in connexion with the Wolffian duct and its tubules. 285
202. Section through wall of vaginal cyst (*Photomicrograph*) . . . 287
203. Retention cysts in the cervix uteri 288
204. Small parovarian cyst 290
205. Section through wall of parovarian cyst (*Photomicrograph*) . . 290
206. Hydatid of Morgagni and cysts of Kobelt's tubules 291
207. Section of follicular cyst of ovary (*Photomicrograph*). . . . 292
208. Pseudo-tubo-ovarian cyst 293
209. Inflammatory tubo-ovarian cyst 294
210. Teratological ovarian hydrocele 295
211. Lipoma of labium majus 296
212. Pedunculated fibroma of labium majus. 297
213. Section of urethral caruncle (*Photomicrograph*) 298
214. Section of papillary cyst of vulva (*Photomicrograph*). . . . 299
216. Section of 'erosion' of the cervix (*Photomicrograph*) 301
217. Section of soft adenomatous uterine polyp (*Photomicrograph*) . . 303
218. Section of adenofibromyomatous polyp of the cervix (*Photomicrograph*) 303
219. Section of glandular hyperplasia of the endometrium (*Photomicrograph*) 304
220. Section of glandular hypertrophy of the endometrium (*Photomicrograph*) 305
221. Commonest positions of uterine fibromyomata 307
222A. Low power view of section of fibromyoma uteri (*Photomicrograph*). 309
222B. High power view of section of fibromyoma uteri (*Photomicrograph*) 309
223. Fibromyomatous uterus containing a foetus fifteen weeks old . . 318
224. Fibromyomatous uterus containing a foetus five months old . . 319
225. Section of an oedematous fibromyoma (*Photomicrograph*) . . . 321
226. 'Cystic' (oedematous) degeneration in a fibromyoma 321
227. Section showing hyaline degeneration in a fibromyoma of uterus (*Photomicrograph*) 322

FIG.		PAGE
228.	Section showing 'red degeneration' in a fibromyoma of uterus (*Photomicrograph*)	323
229.	'Egg-shell calcification' of fibromyoma uteri	324
230.	Localized adenomyoma uteri	328
231.	Section of adenofibromyoma uteri (*Photomicrograph*)	329
232.	Section of a telangiectatic fibromyoma of uterus (*Photomicrograph*)	330
233.	Myoma of the round ligament	331
234.	Section of papillomata in a broad ligament cyst (*Photomicrograph*)	333
235.	Ovarian cyst, as delivered through the abdominal incision at operation	335
236.	Section of intracystic fibrous growths in ovarian cystadenoma (*Photomicrograph*)	336
237.	Section through adenomatous portion of wall of cystadenoma of ovary (*Photomicrograph*)	336
238.	Simple multilocular cystic tumour of ovary (*Photograph*)	337
239.	Papillomatous ovarian cyst	343
240.	Papillomatous disease of ovary, resulting from rupture of a cyst containing papillomata	343
241.	Section of intracystic papillomata in ovarian cystadenoma (*Photomicrograph*)	345
242.	Sections of innocent papillomatous ovarian tumour (*Photomicrograph*)	345
243.	Section of wall of lutein cyst (*Photomicrograph*)	346
244.	Section of wall of dermoid cyst (*Photomicrograph*)	346
245.	Multilocular cystic teratoma (dermoid)	347
246.	Section through outgrowth in wall of dermoid cyst (*Photomicrograph*)	348
247.	Another section through the same outgrowth (*Photomicrograph*)	348
248.	Section of fibromyoma of ovary (*Photomicrograph*)	351
249.	Fungating epithelioma of clitoris	355
250.	Sections of epithelioma of clitoris (*Photomicrographs*)	355
251.	Ulcerating epithelioma of labium majus	356
252.	Section of epithelioma of the vulva (*Photomicrograph*)	357
253.	Melanoma of the vulva (*Photograph*)	358
254.	Spindle cell sarcoma of the vulva (*Photograph*)	359
255.	Section of spindle-celled sarcoma of the vulva (*Photomicrograph*)	359
256.	Mixed cell sarcoma of vagina (*Photograph*)	361
257.	Ulcerating squamous cell carcinoma of the cervix	362
258.	Carcinoma ('cauliflower' growth) of cervix	362
259A.	Section of epithelioma of cervix (*Photomicrograph*)	364
259B.	Section of epithelioma of cervix (*Photomicrograph*)	364
260.	Uterus with epithelioma of cervix, and containing a placental polyp	366
261.	Section of adenocarcinoma of cervix (*Photomicrograph*)	367
262.	Adenocarcinoma of cervix	368

FIG. PAGE
263. Carcinoma of cervix associated with pregnancy 370
264. Paquelin's thermo-cautery 374
265. Diffuse adenocarcinoma of body of uterus 376
266. Circumscribed adenocarcinoma of body of uterus 376
267. Section of adenocarcinoma of body of uterus (*Photomicrograph*) . 377
268. Chorionepithelioma of uterus 379
269. Section of chorionepithelioma of uterus (*Photomicrograph*) . . 379
270. Sarcoma of uterus with subperitoneal fibromyomata 381
271. Section of spindle-celled sarcoma of uterus 381
272. Perithelioma of uterus 382
273. Sections of perithelioma of uterus (*Photomicrographs*) . . . 383
274. Section of adenocarcinoma of the Fallopian tube 385
275. Section of round-celled sarcoma of Fallopian tube 386
276. Section showing adenocarcinomatous invasion of ovarian cystadenoma (*Photomicrograph*) 388
277. Section of papillary adenocarcinoma of the ovary (*Photomicrograph*) 388
278. Section of mixed-celled sarcoma of ovary (*Photomicrograph*) . . 390
279. Section of adenocarcinoma of ovarian cyst secondary to carcinoma of rectum (*Photomicrograph*) 408
280. Section of leucoplakia of vulva (*Photomicrograph*) 411
281. Author's operation braces 417
282. Open method of ether administration; gamgee tissue face mask (*Photograph*) 418
283. Open method of ether administration; completed preparations (*Photograph*) 418
284. Martin's modification of the Riva-Rocci sphygmomanometer . . 427
285. Moynihan's method of emptying distended intestine 429
286. Intravenous infusion of saline solution. Inset, funnel for same . 436
287. Submammary administration of continuous saline infusions . . 437
288. High pressure steam sterilizer 440
289. Stack's dressing sterilizer 441
290. Surgeon in operation attire (*Photograph*) 442
291. Author's reels and container for silk sterilization 443
292. Bartlett's method of sterilizing catgut by heating in alboline . . 444
293. Mayo Robson's catgut sterilizer 445
294. Method of carrying silkworm gut, and the withdrawal of single thread (*Photograph*) 445
295. Patient on operation table ready for abdominal section (*Photograph*) 446
296. Patient in the Trendelenburg position (*Photograph*) 446
297. Pelvic organs as seen with patient in Trendelenburg position . . 447
298. Author's portable operation table (*Photograph*) 448

FIG.		PAGE
299.	Split rubber tube and gauze drain (*Photograph*)	450
300.	Author's peritoneum forceps	452
301.	Author's ring retractor	452
302.	Doyen's retractor	453
303.	Closure of the abdominal wound: approximation of aponeurosis	453
304A.	'Bootlace' subcutaneous method of skin suture	454
304B.	Different stage of the same method of skin suture	454
305.	Pedicle needle	456
306.	Abdominal hysterectomy: early stages	457
307.	Author's needle holder	458
308.	Abdominal hysterectomy: final stages	458
309.	Supravaginal hysterectomy	460
310.	Volsellum forceps	460
311.	Myomectomy	461
312.	Hysteropexy	462
313A.	Gilliam's operation: first stage	464
313B.	Gilliam's operation: second stage	464
314.	Author's 'finger-grip' forceps	465
315A.	'Sling' operation: first stage	466
315B.	'Sling' operation: second stage	466
316.	Wylie's operation for shortening the round ligament	467
317.	Author's pelvic retractor	467
318.	Method of shortening utero-sacral ligaments	468
319.	Method of suturing and turning in the stump after oöphorectomy	470
320.	Author's ring retractor and rubber sheet in use	473
321.	Salpingectomy, with removal of wedge-shaped piece of uterine cornu	473
322.	Clover's crutch for lithotomy position	474
323.	Kelly's bag, for use with the lithotomy position	474
324.	Patient in the lithotomy position, prepared for operation	475
325.	Incisions for removal of malignant growth of labium majus	476
326.	Incisions for removal of centrally placed malignant growth of vulva	477
327.	Incision for the 'flap method' of perineorrhaphy	479
328.	'Flap method' of perineorrhaphy: first stages	480
329.	'Flap method' of perineorrhaphy: later stages	480
330.	Incisions for perineorrhaphy when the tear is into rectum	481
331.	Continuation of the operation of perineorrhaphy for complete laceration	482
332.	Perineorrhaphy for complete laceration: the operation completed	482
333.	Kelly's method of perineorrhaphy	483
334.	Kelly's method of perineorrhaphy: later stage	483
335.	Kelly's method of perineorrhaphy: operation completed	483

FIG.		PAGE
336.	Perineorrhaphy: Holden's method. Early stage	484
337.	Perineorrhaphy: Holden's method. Later stage	485
338.	Perineorrhaphy: Holden's method. Operation completed	486
339.	Anterior colporrhaphy: first stage	487
340.	Anterior colporrhaphy: final stages	488
341.	Repair of vesico-vaginal fistula: incisions	489
342.	Repair of vesico-vaginal fistula: closure of bladder	489
343.	Repair of vesico-vaginal fistula: final stage	490
344.	Removal of large vaginal cyst of the Wolffian duct	492
345.	Various forms of vaginal retractors	493
346.	The operation of trachelorrhaphy	494
347.	Pozzi's operation for congenital stenosis of cervix: first stage	495
348.	Pozzi's operation for congenital stenosis of cervix: second stage	496
349.	Pozzi's operation for congenital stenosis of cervix: final stage	496
350.	Amputation of vaginal cervix: incisions	497
351.	Amputation of vaginal cervix: dissection and removal	498
352.	Amputation of vaginal cervix: sutures	498
353.	Graduated metal dilator for cervix	499
354.	Auvard's sharp flushing curette	500
355.	Wire snare for polypi	502
356.	Schuchardt's paravaginal incision	503
357.	Vaginal hysterectomy: ligation of broad ligament	505
358.	Vaginal hysterectomy: delivery of the uterus	506
359.	Vaginal hysterectomy: closure of vault of vagina	507
360.	Vaginal hysterectomy: operation completed	508
361.	Webb's insulated sounds for intrauterine ionization	511
362.	Apostoli's bipolar vaginal electrode	513
363.	Webb's bipolar intrauterine electrode	513

CHAPTER I.

THE EVOLUTION AND DEVELOPMENT OF THE FEMALE GENITAL ORGANS.

§ i. EVOLUTION.

All living matter is perpetuated by reproduction, whether that reproduction be brought about by a simple process such as 'fission' in the amoeba, or by the more complicated method of repeated nuclear division seen in the fertilized human ovum. And, as with all other organs and structures of a highly complex type, the genital apparatus of the human female has been evolved from simpler forms. If, therefore, we go back in the scale of evolution from the higher orders to the lower we see a gradually diminishing complexity of detail in the means whereby the desired effect of reproduction is brought about.

It would be of no practical value to discuss here the evolution of the human reproductive organs from as far back as the amoeba, but it will be of considerable interest and instruction in regard to the subjects of development, physiology, and malformations briefly to trace the evolution of these organs through the large group of creatures included in the term 'Vertebrata.' It must, however, be understood that the chain is a very broken one, and that whole classes formerly thought to be in a direct line of evolution are now known to represent side branches.

It is true that further back than the vertebrata hermaphroditism, a condition in which both male and female organs are possessed by each individual, can be found; and that hermaphrodites are occasionally met with in the human subject. These cases of atavism (reversion to ancestral type), if such it can be called, are, however, so rare that it is hardly necessary to do more than mention their connexion with evolutionary processes in this way.

It will be sufficient to start, then, with those fishes in which there are separate male and female individuals.

In the female lamprey (a cartilaginous fish) a very simple type of reproductive apparatus is found (fig. 1). There is merely an ovary (possibly two fused together) suspended by a mesentery to the posterior abdominal wall. This organ discharges the ripe ova directly into the abdominal cavity, whence they escape to the exterior by means of the 'genital pore' or 'peritoneal outlet'—a small, short

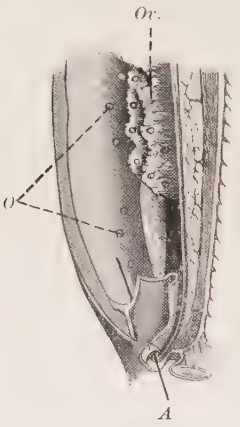

Fig. 1.—Reproductive organs in the female lamprey. (*After Owen.*)

Ov. Ovarium. *O.* Ova that are lying free in abdominal cavity. *A.* Genital pore, into which a bristle has been inserted and through which the ova escape to the exterior.

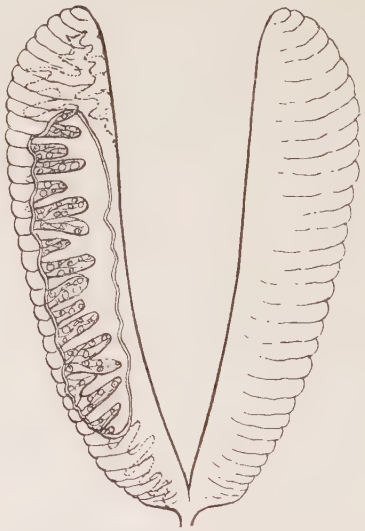

Fig. 2.—Female reproductive organs in the herring.

channel connecting the abdominal cavity with the exterior. The 'peritoneal outlet' is the earliest evolutionary type of the oviducts proper.

In the next stage, seen in osseous fishes (fig. 2), the ovaries (in some species there is a single organ) are enclosed in a peritoneal sac. The central portion consists of the ovarium proper, and it abuts upon a central cavity or canal into which the ova are discharged. These canals unite on either side to form a common oviduct, through which the ova are conveyed to the exterior for fertilization.

In the amphibia we find a still further advance. The ovaries are separate organs which discharge their ova into the abdominal cavity, whence they find their way into the oviducts and are conveyed to the exterior. In most species the oviducts open by separate orifices into the cloaca (fig. 3). In some species the oviducts become confluent, and have only one opening.

In all these lower types the ova, after they have been ejected from the oviducts, are fertilized by the spermatozoa of the male, which are poured over them.

The next stage is reached in the salamanders, which are ovo-viviparous; that is to say, the fertilized eggs develop in the lower portion of the oviduct, and the young burst out in the process of parturition. In these, therefore, the spermatozoa of the male are received into the cloaca, whence they ascend the oviducts to fertilize

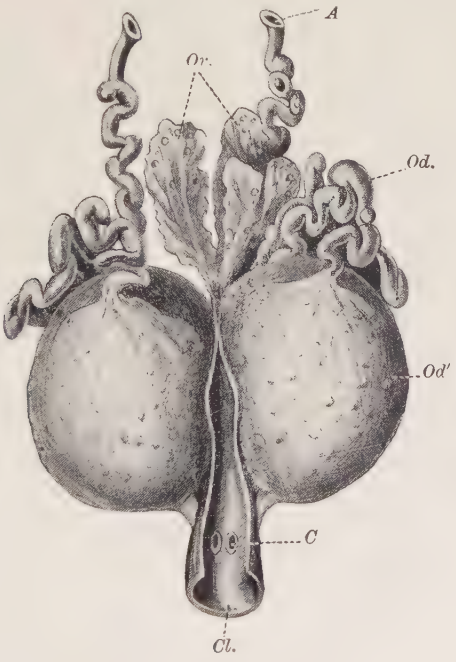

Fig. 3.—Female reproductive organs in the frog. (*After Owen.*)

Ov. Ovaries. *Od.* Oviduct. *Od'.* Lower part of oviduct distended with eggs. *A.* Abdominal ostium of oviduct. *Cl.* Cloaca. *C.* Cloacal ostium of oviduct.

the ova. Copulation only takes place in the sense that the labia of the cloacae in the two sexes meet and the seminal fluid poured out by the male is taken in by the female. From the foregoing facts we naturally expect to find a considerable evolutionary modification in the genital apparatus of the female salamander, as indeed we do. The ovaries are large organs containing many ova, which escape into the upper opening of the oviduct on either side, and passing down are fertilized in the lower part, which expands as the ova develop. This represents, then, the earliest stage of differentiation of the oviducts into the upper or 'Fallopian' and lower or 'uterine' portions (fig. 4).

Next we come to the reptiles, in which a distinct advance in the evolution of all parts of the genital apparatus is to be observed. The ovary becomes more compact; that is to say, the ova are fewer and there is more stroma. The Fallopian orifice becomes free and trumpet-shaped, and the oviducts on either side are divided into a Fallopian portion and a uterine; the latter secretes the egg-shell in those species among the higher reptiles, such as the crocodiles, in which a definite calcareous shell protects the egg. We notice,

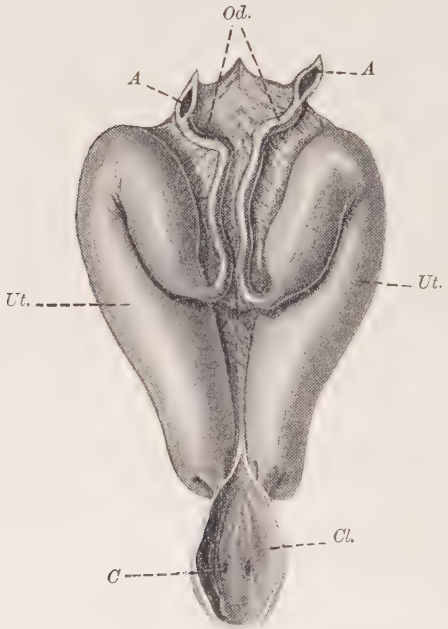

Fig. 4.—Genital passages in the female salamander. (*After Owen.*)

Od. Oviducts. *A.* Abdominal ostia of oviducts. *Ut.* Pregnant uteri. *C.* Opening of the uterus into the cloaca. *Cl.* Cloaca.

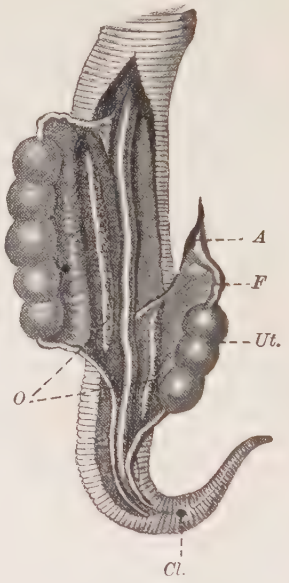

Fig. 5.—Female reproductive organs in the snake (viper). (*After Owen.*)

A. Abdominal ostium. *F.* Fallopian portion of oviduct. *Ut.* Uterine portion of oviduct (pregnant). *O.* Ovaries. *Cl.* External orifice of the cloaca.

too, that in many species the left ovary and duct are larger than those on the right side. The oviducts open into the cloaca, one on each side (fig. 5). In most of the reptilia direct copulation takes place.

From the prosaurians spring on the one hand the reptiles and birds, and on the other the lowest mammals. We need not concern ourselves by following out the structure of the birds more than to call attention to the facts that they, like many of the reptiles, are oviparous, and lay eggs coated with calcium salts, and that in them the oviduct and ovary on the right side disappear, leaving only the left functional. This oviduct opens into the cloaca.

When we attempt to trace the progress of evolution on towards woman through the mammals, we are at once confronted by facts of considerable structural and physiological importance. It is, however, a matter of regret that many of the links in the chain of descent are missing—extinct; and that even those that do exist are not

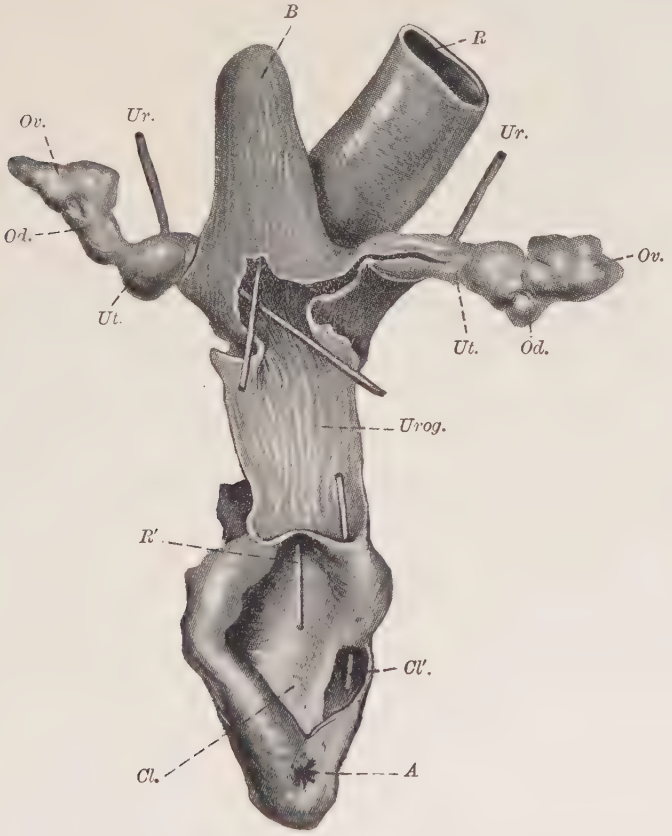

Fig. 6.—Female reproductive organs in the platypus (ornithorhynchus).

A. Anus. *B*. Bladder. *Cl*. Cloaca. *Cl'*. Bristle passing through sphincter opening between the cloaca and urogenital sinus. *Od*. Oviducts. *Ov*. Ovaries. *R*. Rectum. *R'*. Bristle passing through the opening of the rectum into the cloaca. *Ur*. Ureters. *Urog*. Urogenital sinus. *Ut*. Uteri.

all in the direct line, but are in many cases offshoots or collateral branches. The mammals forming the lowest group now in existence are known as the monotremes, and of these only two species are now extant, the ornithorhynchus (platypus or duck-bill) and the echidna (spiny ant-eater). The point of supreme interest, as we shall see later, in connexion with these creatures is that, although mammals, they are oviparous—that is to say, they lay eggs—and their eggs are coated with calcium salts. In many ways the genital

apparatus of these animals has a close resemblance to that of the higher reptiles and birds: the ovaries are not very compact, and the organ on the left side, and its duct, are usually larger than the corresponding structures on the right side. The oviducts open on each side of a chamber—the urogenital sinus—into which also open the ureters and allantoic bladder. This chamber itself opens by a sphincter orifice into the cloaca in front of the rectum (fig. 6). We have thus in these, the lowest mammals, a direct link between the highest mammal, woman, and the reptilia and their ancestors, both in structure and function.

There is now a wide gap before we reach the lowest of the viviparous placental mammals—the marsupials. In these the fertilized ovum forms a placental attachment to the uterine wall, yet this is of such an imperfect or temporary character that the young is born long before it is fully developed. Consequently the mother places it in the marsupium or pouch, where it remains hanging to a mammary teat while its further growth and development are being completed. The structure of the female genitalia of marsupials is important, for here it is that we first find vaginae. In some marsupials, such as the phalanger, the two vaginae which connect the uteri with the urogenital sinus—now quite shut off from the cloaca—are canals of some considerable length, forming semicircles outwards (fig. 7). In other marsupials, such as the opossum and kangaroo, the uteri and lateral vaginae open into a central vaginal pouch, which has a more or less perfect longitudinal septum and ends blindly at the summit of the urogenital sinus—compact tissue intervening between the two chambers (fig. 8). It is very interesting to note that the young of the kangaroo are not born by passing round the circuitous lateral vaginae, as occurs in other marsupials, but that the tissue intervening between the blind central vaginal pouch and the urogenital sinus is broken down during parturition and a straight exit for the young thus obtained. It has been supposed that the less fully developed foetus in the other species of this group follows the more devious route in order that development may proceed for a longer period before birth, by protraction of the parturient process (ovoviviparity).

To the formation of the central vagina in the marsupials considerable importance has been attached as bearing some relation to what happens developmentally in woman. It is probable, however, that no strict comparison is justifiable, since the kangaroos are certainly offshoots from the line of descent of the human race. In the marsupials there are, of course, two distinct uteri, Fallopian tubes and ovaries.

The next order we shall consider is that which comprises the rodents: this group contains such common species as the rabbit and the rat. In these we at last approach the higher types of the placental mammal. The foetus is born 'at full term,' that is to say, fully developed; and the female genital apparatus becomes more nearly approximated to the type we shall eventually consider in woman. The main points of importance to be noted are that the vagina, from being septate, or double, in the lower members of this group

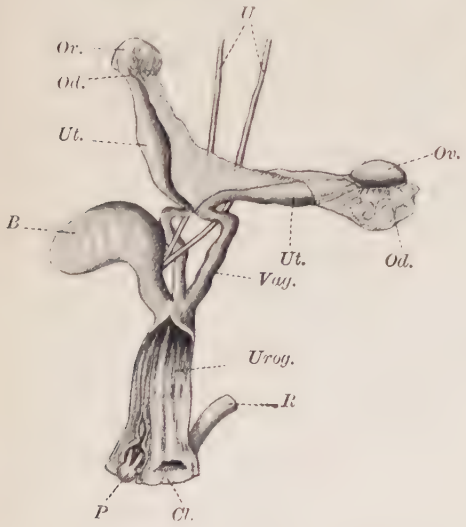

Fig. 7.—Female reproductive organs in the phalanger. (*After Wiedersheim.*)

Ov. Ovaries. *Od.* Oviducts. *Ut.* Uteri. *U.* Ureters. *B.* Bladder. *Vag.* Vagina. *Urog.* Urogenital sinus. *R.* Rectum. *P.* Clitoris. *Cl.* Cloaca.

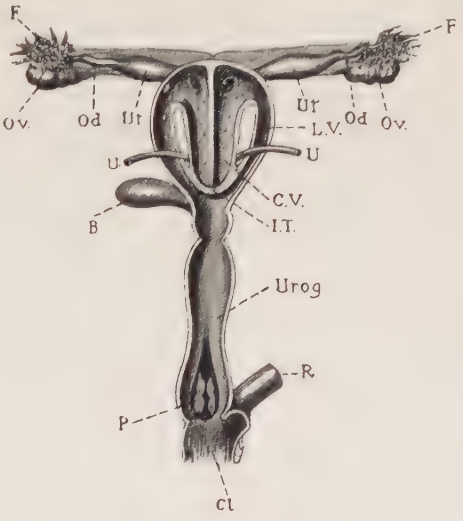

Fig. 8.—Reproductive organs of the opossum. (*After Wiedersheim.*)

F. Fimbriae of the Fallopian tubes (*Od.*). *Ov.* Ovaries. *Ut.* Uteri. *L.V.* Lateral vagina. *C.V.* Central vagina. *I.T.* Intervening tissue through which the young are born in the higher members of the group. *B.* Bladder. *U.* Ureters. *Urog.* Urogenital sinus. *P.* Clitoris. *R.* Rectum. *Cl.* Cloaca.

(fig. 9 A), becomes single in the higher (fig. 9 B and C); and that it gradually forms a separate channel, with the urinary passage lying in front of it instead of opening into a common urogenital sinus, or opening together with it on the exterior, as in the lower species of this class. So, also, in this group is there a gradual evolution from the two distinct uteri, with separate ora in the lower species (fig. 9 A and B), to the double uterus with a single os in the higher (fig. 9 C).

It is important to notice that in certain species of rodent—and, indeed, in various species of several other orders of mammals—the ovaries are contained in peritoneal pouches (cf. also fig. 2 and context). This prevents the ova from getting into the general peritoneal cavity on their way to the Fallopian tubes. A similar condition has

occasionally been observed in woman, and will be referred to later (p. 294).

We can now pass over several orders of mammals to consider the carnivora, in which the two uterine bodies fuse in the lower part to form a bicornuate uterus (fig. 9 D). If we pursue our investigations onwards through the lemur we are gradually brought to the human uterus with its definite fundus into which the two Fallopian tubes open sharply at a right angle, instead of by a gradual process of

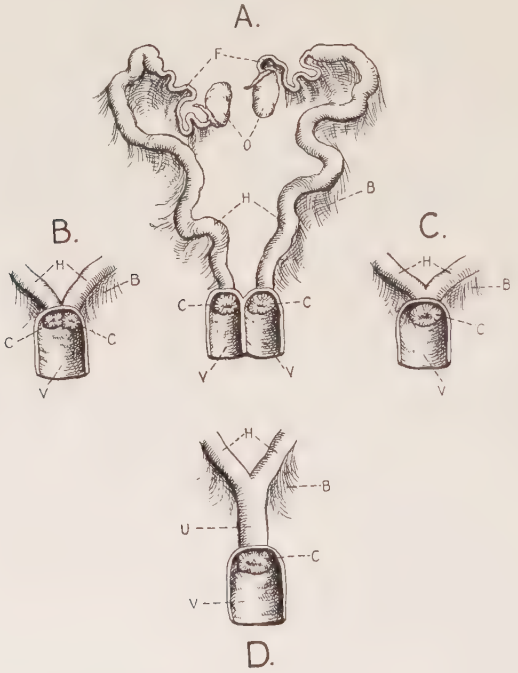

Fig. 9.—Semidiagrammatic illustration to show the gradual evolution from the double uterus and vagina of the lower rodents (A) to the bicornuate uterus of the carnivora (D).

B. Broad ligaments. *C.* Cervix uteri. *F.* Fallopian tubes. *H.* Uterine cornua. *O.* Ovaries. *U.* Uterus. *V.* Vagina.

tapering off from each uterine horn, as is seen in the lower mammals. The vagina is completely shut off from the rectum behind, and the urethra in front, and the ovary is a compact organ evolved, as we have seen, from a loosely connected mass of ova.

. . . . . .

Having taken this cursory survey of the evolution of the female genital organs we shall the more easily understand their development, since this naturally follows on the lines of evolution.

§ ii. DEVELOPMENT.

About the twenty-first day after fertilization the human ovum has reached a stage of differentiation at which it is possible to recognize that part of the mesoderm which constitutes the **intermediate cell mass**, and from which the urogenital system is derived (fig. 10). Formerly the early stages were incorrectly dated, owing to the fact that sufficiently early embryos had not then been obtained.

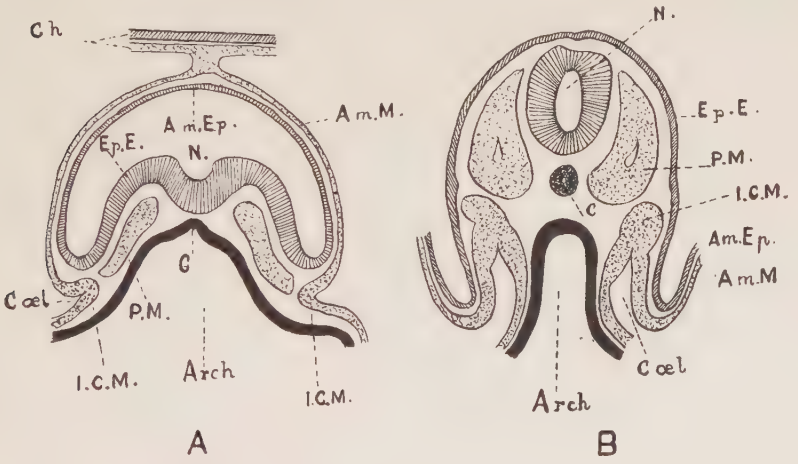

Fig. 10.—Diagrams of transverse sections of human embryos, to show the origin of the intermediate cell mass. (*After Keith.*)

A. 15-day embryo. B. 20-day embryo.

Epiderm is shaded; mesoderm stippled and hypoderm black.

I.C.M. Intermediate cell mass. *N.* Neural groove and canal. *Ep.E.* Epiderm of embryo. *Am.Ep.* Epiderm lining amnion. *Am.M.* Mesoderm on amnion. *Ch.* Chorion. *P.M.* Paraxial mesoderm. *C.* Notocord. *Coel.* Coelom. *Arch.* Archenteron.

From the intermediate cell mass the **Wolffian body** and **Wolffian duct** are developed, and project into the coelom or primitive body cavity, on each side at the base of the mesentery of the gut.

At the beginning of the second month of foetal life the **genital ridge** can be seen developing from the Wolffian body on the inner (mesial) aspect (fig. 11). A common urogenital mesentery connects the Wolffian body and genital ridge with the posterior abdominal wall. From the genital ridge the ovary is developed. On the outer side of the Wolffian projection, and anterior to the Wolffian duct, the **Müllerian duct** is formed by a process of tubular invagination. The Fallopian tubes, the uterus and upper portion of the vagina are produced eventually from the Müllerian ducts.

At this early stage it is impossible to say whether the genital ridge is going on to form an ovary or a testis; and likewise it is uncertain whether the Müllerian ducts will persist, and the Wolffian ducts atrophy, with the formation of a female individual; or whether the Müllerian ducts will atrophy, and the Wolffian persist, to accommodate the masculine requirements. We are only concerned here with the development of the female genital organs, and from this stage it will be best to trace the further development of each part separately. The normal progress of development is of great importance, for only by a thorough knowledge of it can we recognize and explain the malfor-

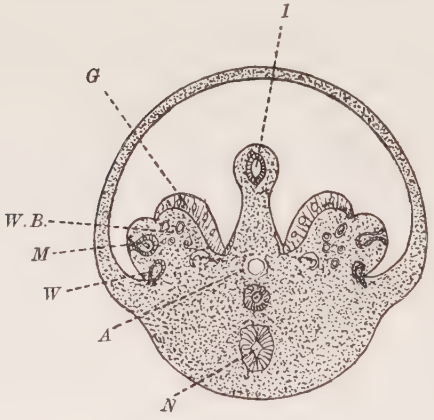

Fig. 11.—Diagrammatic section through the cœlom about the fourth week, showing the relationship of the various parts of the urogenital system. (*After Keith.*)

I. Intestine. *A.* Aorta. *N.* Neural canal. *G.* Genital ridge. *W.B.* Wolffian body. *M.* Müllerian duct. *W.* Wolffian duct.

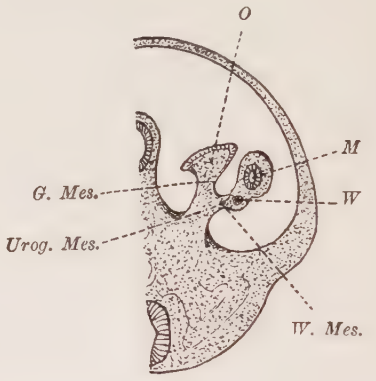

Fig. 12.—Diagram to show the relationship of the various structures derived from the intermediate cell mass, and their mesenteries.

O. Ovary. *M.* Müllerian duct. *W.* Wolffian duct. *G.Mes.* Genital mesentery (mesovarium). *W.Mes.* Wolffian mesentery (mesosalpinx). *Urog.Mes.* Urogenital mesentery.

mations, and certain other pathological conditions, due to developmental defects, which we may meet in our clinical work.

THE OVARY, as we have just seen, is developed from the genital ridge, which gradually becomes differentiated from the Wolffian body, and attached thereto by the **mesovarium** (fig. 12). On the surface of this genital ridge the epithelium becomes thickened and columnar in shape, forming the '**germinal**' **epithelium** which is, at this time, several cells deep. At quite an early stage large spherical cells are seen among the cells of the 'germinal' epithelium; these are the **primitive ova**. It is still a disputed point whether these primitive ova are developed *in situ* or not. The bulk of evidence is in favour of their pre-existence.

It is probable, therefore, that they have been collected in this situation, having existed from the earliest stages of segmentation. Indeed the view has been put forward that teratomata, found elsewhere than in the ovary, arise from primitive ova which have not been deposited in the normal situation. Figure 13 is an illustration of the genital ridge of the embryo chick which shows well the primitive ova.

Let us follow the development of the ovary a little further, and trace the formation of the Graafian follicles, and certain other cellular constituents of this important organ.

The **Graafian follicles** are produced by the enclosure of the primitive ova by a covering of cells which form the **membrana granulosa**: at first this is single, later it consists of many layers, and

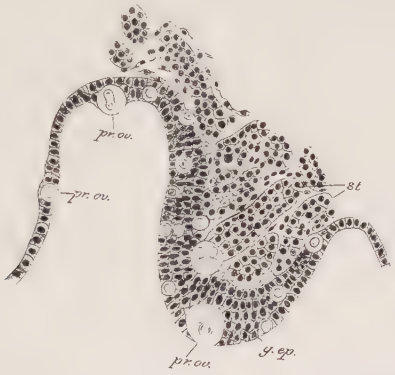

Fig. 13.—Section of the 'germinal' epithelium and adjacent stroma in chicken embryo. (*Semon, from Quain's Anatomy.*)

g.ep. Germinal epithelium. *pr.ov.* Primitive ova. *st.* Stroma.

is separated from the stroma by the formation of a basement membrane. The ovum itself also develops a membrane, known as the *zona pellucida*, which separates it from the cells of the membrana granulosa. Whether this be formed from the membrana granulosa or from the ovum is unknown.

There are two views as to the origin of the cells of the membrana granulosa. Originally Waldeyer put forward the view that they arose from islets of epithelial cells which were produced by tubular down-growths from the surface ('germinal') epithelium. This view is the one held in the present day by most authorities. The author can only state that he has never seen in microscopical sections from the ovaries of animals or the human subject anything which enables him to endorse this view. In fact, the view of Foulis, that the cells of the membrana granulosa arise from cells in the stroma, appears to be based on better evidence. In the ovary of any young animal or child

whorls of stroma cells may be seen surrounding the primitive ova, and in immediate contact with them is a ring of spindle-shaped cells, which by a process of metaplasia (change of type) eventually become columnar. In some places islets of cells not in contact with the ova may be seen gradually undergoing metaplasia. These conditions are well shown in figure 14, in which the 'germinal' epithelium is seen to be intact, and to show no downgrowths, while the whorls of stroma cells are most marked.

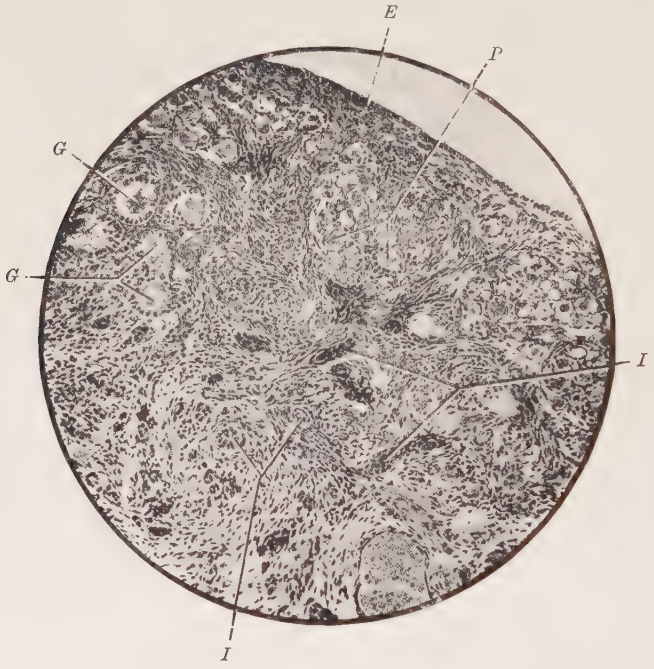

Fig. 14.—Section of ovary (from a young bitch). ×220.
(*Photomicrograph.*)

E. 'Germinal' epithelium on the surface; it will be seen there are no downgrowths from it. *P.* Primordial ova being surrounded with whorls of stroma cells. *I.* Stroma cells not in contact with ova, forming islets. *G.* Ova surrounded by stroma cells to form Graafian follicles.

If this view be adopted it enables us to understand the state of affairs seen in the ovary of the young rabbit (fig. 15), which, like the ovary of an infant, is crowded with primitive ova, that have probably not been derived from the 'germinal' epithelium. The ova are gradually forced towards the surface by the formation—which is not to be observed in the same way in the human subject—of what are known as the **interstitial cells**, which are polygonal in outline, and form nearly the whole of the stroma in the adult rabbit's ovary. It is

practically certain, also, that these interstitial cells give rise to an internal secretion. It is significant that these cells are most prominent in the ovaries of animals, like the rabbit, in whom the thyroid gland is not a very active or vital organ.

Now it is probable that the interstitial cells have the same origin as those which form the cells of the membrana granulosa of the Graafian follicle, and that they correspond to the islets of stroma cells seen in the human ovary. Indeed the cells which fill degenerate (atresic) follicles in the rabbit's ovary and arise from the membrana granulosa can hardly be distinguished from the interstitial cells of the stroma. In the human ovary these altered stroma cells, like the interstitial cells of the rabbit, probably supply the internal ovarian secretion, the properties of which will be discussed later (p. 66), as also will be the further development and maturation of the Graafian follicle (p. 38).

Fig. 15.—Ovary from a rabbit a few weeks old. ×50. (*Photomicrograph.*)
P.O. Primordial ova. *G.F.* Graafian follicles.

THE DEVELOPMENT OF THE FALLOPIAN TUBES AND UTERUS (and the fate of the Wolffian duct).—While the ovum has been developing, the **Müllerian ducts** have also been advancing towards the formation of the genital tract. These ducts become definitely tubular, the upper ends only remaining open, and forming eventually the abdominal ostia of the Fallopian tubes. The caudal extremities of the Müllerian ducts grow back, with the Wolffian ducts lying on the inner side of them. These ducts lie together in a free fold or mesentery (fig. 12). As the Müllerian ducts are traced downwards they are found to change their position, and to lie below and internal to the Wolffian ducts. In this way the Müllerian ducts gradually come together in the pelvis; and at this stage they are in two parts:

(1) Where they lie apart, above the pelvis, suspended on each side by the Wolffian mesentery, an offshoot of the common urogenital mesentery.

(2) Where they have come together in the pelvis to form with the Wolffian ducts the **genital cord** (fig. 16).

Those portions of the Müllerian ducts which lie in the genital cord eventually fuse to form the uterus, while the upper free portions form the Fallopian tubes.

The **Wolffian body** and **duct** are at this stage in a process of atrophy, and this is continued until all but the slightest traces of them, so far as the generative organs are concerned, is obliterated. It will be well, however, to discuss here the fate of the Wolffian remnants, since they may be the source of origin of cysts, and thus cross our path later on. These relics are carried down into the pelvis with the 'descent' of the genital organs, and are found in the meso-salpinx, which was originally the Wolffian mesentery. The upper part of the Wolffian body (pronephros) persists as the *hydatid of Morgagni*, a cyst frequently seen at the fimbriated extremity of the Fallopian

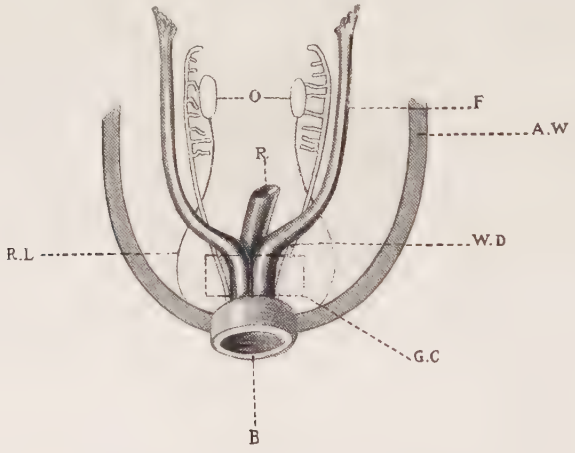

Fig. 16.—Diagram to show the formation of the genital cord at the tenth week. (*After Keith.*)

O. Ovaries. *F.* Fallopian tube. *W.D.* Wolffian duct. *R.L.* Round ligament. *G.C.* Constituents of genital cord: the fused Müllerian ducts, and the Wolffian ducts. *B.* Bladder cut across and turned down forwards. *R.* Rectum. *A.W.* Abdominal wall.

tube (fig. 17 B). The Wolffian (Gartner's) duct itself, which persists in some female animals and even very rarely in woman, takes a curved course beneath the Fallopian tube, and passing down in the wall of the uterus, runs along the upper and lateral wall of the vagina to be lost below the urethra.

The 'genital tubules,' which connect the primitive genital gland with the Wolffian duct (fig. 17 A) and form the epididymis in the male, persist at the hilum of the ovary as the **epoöphoron**, or **parovarium**; the outermost, which do not run to the ovary, being known as **Kobelt's tubules**. The 'renal (Wolffian) tubules'—connecting the Wolffian duct with the primitive mesonephros, which, like the pronephros, atrophies in both sexes (fig. 17 A)—lie between the ovary and the uterus, and form the **paroöphoron** (fig. 17). Cysts may arise in connexion with any of these structures.

We are now free to trace more fully the **fusion of the Müllerian ducts** and the '**descent**' **of the genital organs** into the pelvis. In order that a normal uterus may be formed it is, as already indicated, essential that the Müllerian ducts should fuse in the lower half, and the intervening duct walls disappear at this part so that a single chamber (uterine cavity) may be produced. As we shall see in Chapter V. many malformations arise as the result of the failure of the two ducts to fuse completely in this way. There is, sometimes, a reversion, or atavism, which may result in the complete separation of

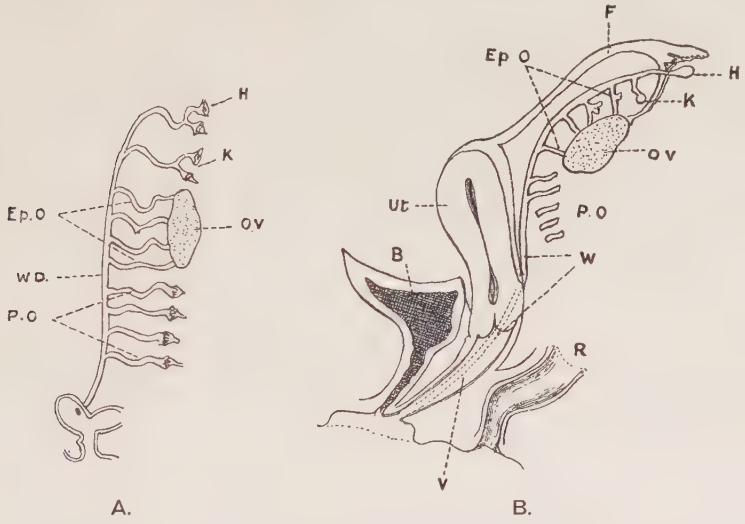

Fig. 17.—Diagrams to show the fate of the Wolffian duct and its tubules in woman. (*After Keith.*) A. Scheme of the derivatives of the Wolffian body on the right side. B. Remnants of Wolffian body in the female.

H. Opening into caelom; Hydatid of Morgagni. *K.* Glomeruli of the pronephros and Kobelt's tubules. *Ov.* Ovary. *Ep.O.* Genital tubules and epoöphoron. *P.O.* Renal tubules (mesonephros) and paroöphoron. *W.D.* and *W.* Wolffian duct and remains. *F.* Fallopian tube. *Ut.* Uterus. *B.* Bladder. *V.* Vagina. *R.* Rectum.

the two uterine horns, a condition such as that seen in the rabbit; or in a bicornuate condition with fusion at the lower part, as is found in the carnivora (fig. 9).

There is considerable doubt as to the guiding forces which bring the Müllerian ducts together into the pelvis, and lead to the fusion of the lower parts; for, as we have seen, this is an evolutionary advance from lower forms. No doubt the causal factors are closely associated with the general 'descent' of the genital organs 'into' the pelvis, so that we must now turn our attention shortly to this question.

We have already seen (fig. 11) that the Wolffian body, in connexion with which the ovaries and Müllerian ducts originate, is sus-

pended from the posterior abdominal wall by the urogenital mesentery; but that later the ovary itself is attached to the inner side of the Wolffian body, by the mesovarium, which is the upper part of the genital mesentery (fig. 12); the continuation of this structure downwards to the inguinal region being known as the **genital fold** (plica gubernatrix). In the free margin of this fold the **ligament of the ovary** and the **round ligament** are eventually developed. Further, we have seen that the Müllerian and Wolffian ducts are attached

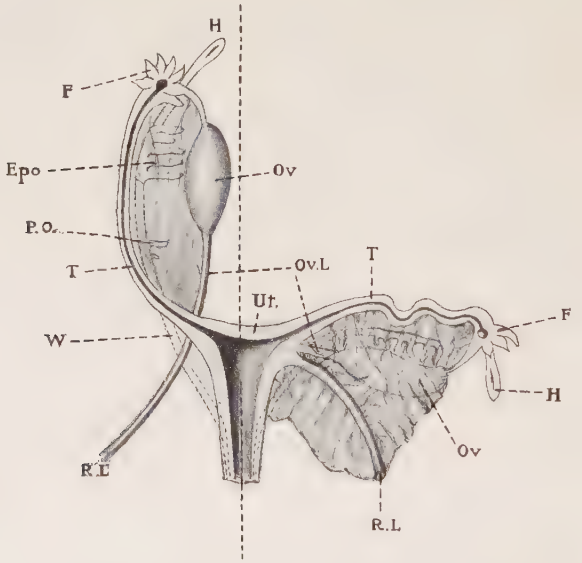

Fig. 18.—Diagram to show alteration from abdominal position of the upper part of the genital apparatus (left-hand side) to the pelvic position (right-hand side). The crossing of the genital and Wolffian mesenteries at the angle of the uterus is also shown in the left half. (*After Kollmann.*)

Ut. Uterus. *Ov.* Ovaries. *Ov.L.* Ovarian ligaments. *H.* Hydatids of Morgagni. *F.* Fimbriated extremities of tubes. *T.* Fallopian tubes. *Epo.* Epoöphoron. *P.O.* Paroöphoron. *W.* Wolffian duct. *R.L.* Round ligaments.

to the outer side of the Wolffian body by the Wolffian mesentery (fig. 12). We must now trace the fate of these mesenteries.

When the intervening Wolffian body, to which the genital and Wolffian mesenteries are originally attached, atrophies, it leaves them as **Y**-shaped offshoots from the original urogenital mesentery, which may itself be represented by the stem of the **Y** (fig. 12). Thus we have the Wolffian mesentery producing the mesosalpinx, and the genital mesentery the mesovarium, which, as just mentioned, joins the mesosalpinx—the fused mesenteries representing the original urogenital mesentery and forming the lower half of the **broad ligament**

(mesometrium) below, and the **infundibulo-pelvic ligament** (plica vascularis) above (fig. 20).

As we trace these structures down to the pelvis we find that the genital mesentery, or more strictly the genital fold, crosses the Wolffian mesentery (figs. 18 and 20). The genital fold above the crossing persists as the ligament of the ovary with its mesentery, and below as the round ligament. The Wolffian mesentery above the crossing becomes the mesosalpinx, and below is incorporated in the mesometrium, as already stated. The point at which the genital and Wolffian mesenteries cross marks, therefore, the spot at which the differentiation occurs of the original Müllerian duct into Fallopian and uterine portions.

To recapitulate. We have, then, the following state of affairs: a Wolffian mesentery, containing the Müllerian duct and remnants of the Wolffian body and duct, and eventually becoming the mesosalpinx, with the ovary attached to the inner side by the upper part of the genital mesentery (mesovarium). The ovary is attached in this way owing to the disappearance (atrophy) of the interposing Wolffian body. The urogenital mesentery persists in the fused Wolffian and genital mesenteries as the broad ligament. The genital mesentery continued down below the ovary as the genital fold may be recognized above the point at which it crosses the urogenital mesentery as the ovarian ligament, and below as the round ligament, being attached at one spot only to the Müllerian duct—the spot at which the actual crossing of the genital and Wolffian mesenteries occurs (fig. 20). This point of fusion marks the spot at which the Müllerian duct is differentiated into Fallopian and uterine portions. It is clear, then, that the round ligament and ovarian ligament are continuous structures.

We know, further, that muscle fibres are developed in the subperitoneal tissue of these mesenteries, and that the external muscular coat of the uterus is formed from subperitoneal muscular fibres. It is an easy matter to demonstrate this point by cutting a section of a rabbit's uterine cornu with the adjacent mesometrium (fig. 19).

Now for the probabilities. Since the utero-sacral ligaments probably represent the lower attachments of the urogenital mesentery, and the inguinal attachment of the round ligament the lower point of fixation of the genital mesentery, the 'descent' of the genital organs is not quite a correct term, for there is also an ascent of the abdominal parietes around the genital organs, which are held down by less quickly growing mesenteries. Since the pelvic or caudal extremities of the urogenital mesenteries are probably represented by the utero-sacral ligaments, which lie in close apposition on each side of the rectum (fig. 20), the lower ends of the Müllerian ducts are kept close together.

When, therefore, the subperitoneal muscular fibres are formed it appears likely that in some way these decussate and interlock—at any rate on the anterior surface, where, in the utero-vesical pouch, the peritoneal

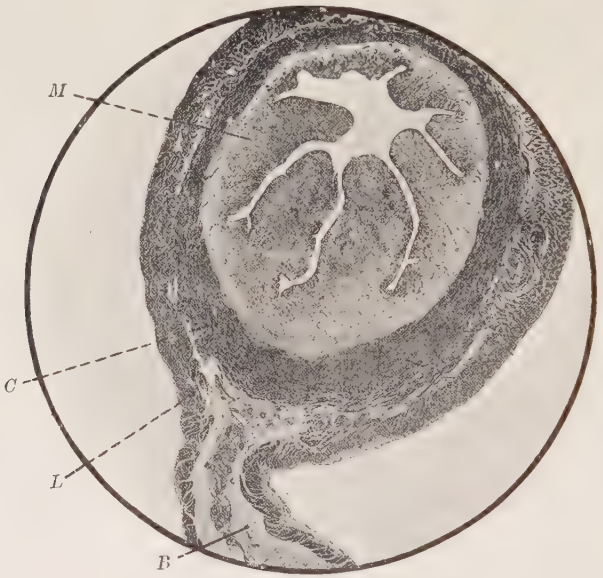

Fig. 19.—Section through the uterine cornu and broad ligament of a rabbit. ×15. (*Photomicrograph*).

B. Broad ligament. *L.* Longitudinal muscular layer. This is seen to be continuous with the subperitoneal muscular layer of the broad ligament. *C.* Circular muscular layer. *M.* Mucous membrane.

surface is continuous (fig. 20)—and in this way lead to fusion of the ducts and the formation of the uterus, whose outer muscular coat is composed of these fibres. While this is occurring in the pelvis there is a considerable 'drag' upon the genital fold attached in the groin, for it is growing less rapidly than the surrounding body wall. Now at this juncture one of two things may occur:

(1) The interlocking muscular fibres mentioned above may prove the stronger and, as they usually do, unite the Müllerian ducts. In this case the genital fold shows evidence of the strain upon it by becoming hypertrophied; this process gives rise to the round ligament.

(2) The genital fold may prove the stronger, and prevent the union of the Müllerian duct in part (bicornuate condition of the uterus), or entirely (didelphic condition). In these malformations the round ligament is usually very much thicker than normal.

In a rare condition, which may be designated *ectopia genitalium*, the genital fold entirely displaces the genital organs, and the inter-

locking fibres do not come into play. Probably in these cases the posterior attachment (utero-sacral) of the urogenital mesentery is deficient or absent. In these circumstances the genitalia are found at the sides of the pelvis or in the inguinal canal.

THE VAGINA.—The development of the vagina, which is now well known, affords much information of clinical value both in regard to malformations and other pathological conditions. The careful study of malformations has played a large part in the elucidation of the

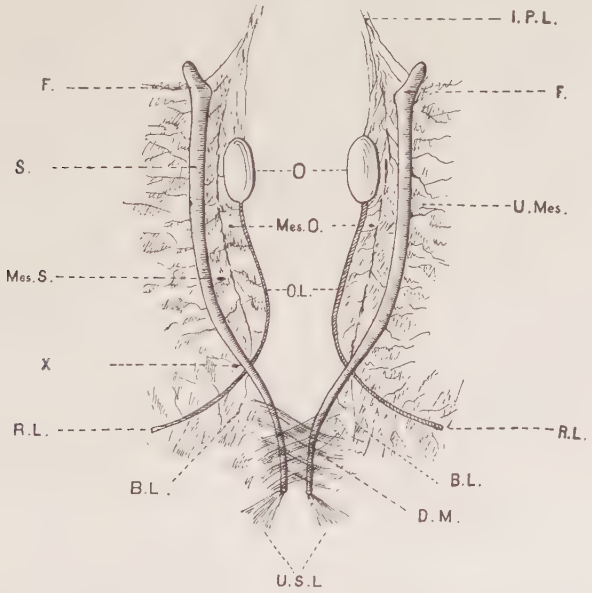

Fig. 20.—Diagram to illustrate the early disposition of the mesenteries, and the action of the subperitoneal muscular fibres which help to bring about the fusion of the Müllerian ducts.

O. Ovaries. *F.* Fimbriated extremities of Fallopian tubes. *S.* Fallopian tube. *O.L.* Ovarian ligaments. *R.L.* Round ligaments. *D.M.* Decussating subperitoneal muscular fibres. *X.* Point at which the genital mesentery crosses the Wolffian mesentery—at this point the round ligament is attached to the uterus. *I.P.L.* Infundibulo-pelvic ligament. *Mes.O.* Mesovaria (genital mesenteries). *Mes.S.* Mesosalpinx (Wolffian mesentery). *U.Mes.* Urogenital mesentery. *B.L.* Broad ligaments. *U.S.L.* Utero-sacral ligaments.

normal development of the vagina. Usually the upper two-thirds of this passage are produced by the downgrowth of solid columns of mesodermic cells from the ends of the Müllerian ducts to the urogenital sinus. The lower third of the vagina is developed from the urogenital sinus itself.

Now the urogenital sinus is that part of the cloaca (the common cavity into which the rectum and bladder open) which becomes shut off from the rectum by the cloacal septum. Consequently it is the

common opening place of the bladder, ureters and Wolffian ducts. Gradually the vesico-vaginal septum grows down and divides the urogenital sinus into an anterior and posterior portion (fig. 21 A), or completely closes in the sinus posteriorly (fig. 21 B). In the first case the downgrowths from the Müllerian ducts perforate the summit of the posterior portion of the urogenital sinus. The normal processes are then completed by the vesico-vaginal septum dividing the posterior part of the urogenital sinus, which is to form the lower part of the vagina, from the anterior part of the sinus, which forms the base of the bladder and urethra (fig. 21 C).

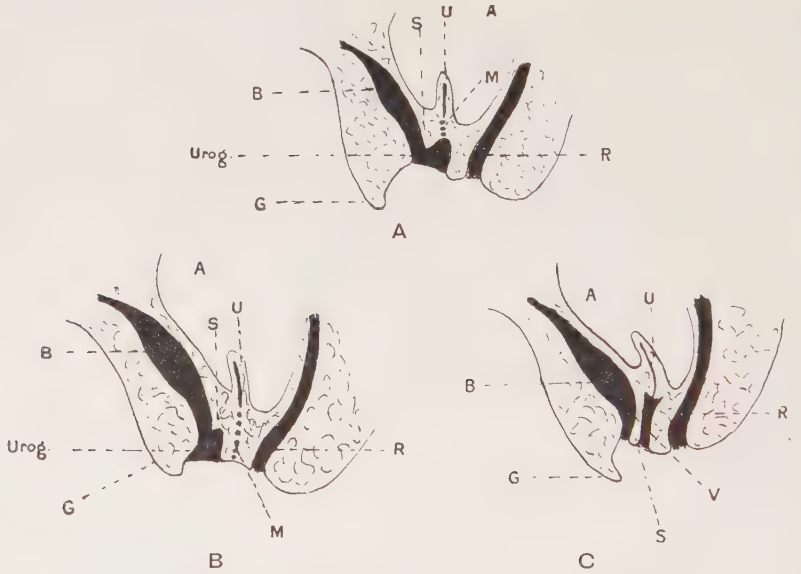

Fig. 21.—Normal methods of development of the vagina. A. When the urogenital sinus forms the lower part of the vagina. B. When the entire vagina is formed from mesodermic downgrowths. C. Normal result in either case.

A. Abdominal cavity. *B.* Bladder. *G.* Genital tubercle (clitoris). *M.* Mesodermic downgrowths from the ends of Müllerian ducts. *R.* Rectum. *S.* Downgrowing vesico-vaginal septum. *Urog.* Urogenital sinus. *U.* Uterus. *V.* Vagina.

Alternatively, and still normally, in the second case (fig. 21 B) the septum does not divide the urogenital sinus into two parts, but instead fills in the posterior portion. In these circumstances the urogenital sinus forms only the base of the bladder and the urethra, while the Müllerian cords have to work their way to the surface behind the urethra. Probably it is under these conditions that atresiae of the lower end of the vagina are found. The normal result, seen in figure 21 C, is, however, usually arrived at, as in the former case.

From the above description of the development of the vagina it will be readily understood that the lower (urogenital) portion may exist in the absence of a uterus, or that it may also be missing. These conditions are illustrated in figure 22 A, B, C and D.

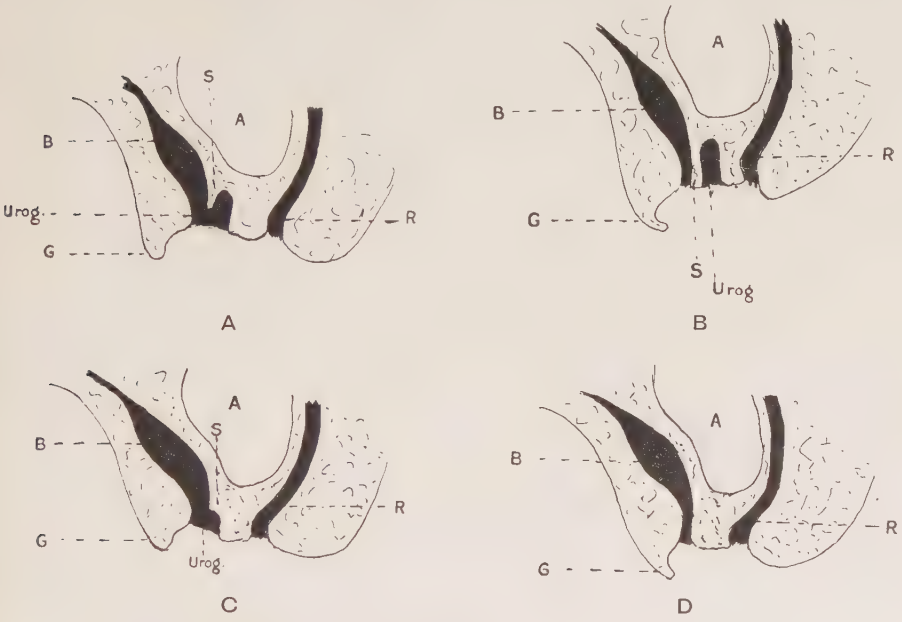

Fig. 22.—Fate of the urogenital sinus in the absence of the uterus and mesodermic downgrowths to form the vagina. A and B illustrate the formation of the urogenital pouch sometimes seen. C and D the complete absence of any vaginal pouch.

A. Abdominal cavity. *B.* Bladder. *G.* Genital tubercle (clitoris). *R.* Rectum. *S.* Downgrowing vesico-vaginal septum. *Urog.* Urogenital sinus.

Normally the cells of the solid cords from the Müllerian ducts become canalized, and form the hollow passage of the vagina in its upper part, or in the whole of its course, as the case may be. It may be pointed out here that the common mode of origin of the lower third of the vagina from the urogenital sinus accounts for the fact that disease of this part may give rise to infection of the inguinal glands.

THE EXTERNAL GENITALIA.—These are all developed in connexion with the primitive urogenital cleft, which is the ectodermic depression that goes to form part of the urogenital sinus when the cloacal membrane is absorbed, and the cloacal septum, shutting off the urogenital sinus from the rectum, has been formed (fig. 23). At the anterior part of the cleft the **genital tubercle** appears as an outgrowth; the apex of this eventually forms the **clitoris**. Outside the clitoris

the **external genital folds**, which become the **labia majora**, are raised up on the edge of the cleft owing to an increase in the thickness of underlying mesoderm, a condition which also gives rise to the genital tubercle (fig. 24).

The cloacal membrane at the base of the genital tubercle is absorbed a little later, with the formation of an urogenital sinus opening on the surface. This opening is bounded by the **inner genital folds** which form the **labia minora** (fig. 24). The junction of the external genital folds in front gives rise to the **mons Veneris**, and

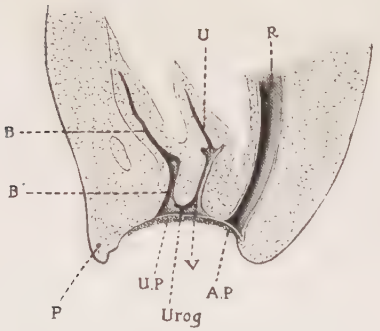

Fig. 23.—Diagram to show the cloacal membrane and its relation to the urogenital sinus.

U. Uterus. *R.* Rectum. *B.* Bladder. *B'.* Urethra. *P.* Genital tubercle (clitoris). *V.* Vagina. *Urog.* Urogenital sinus. *U.P.* Urogenital plate (anterior part of cloacal membrane). *A.P.* Anal plate (? posterior part of cloacal membrane).

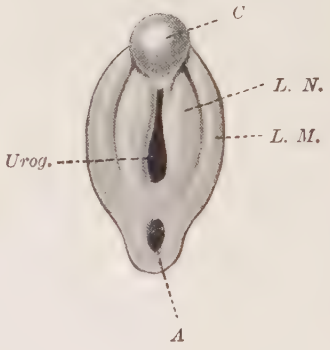

Fig. 24.—Semidiagrammatic representation of the development of the external genitals in the female. (*After Keith.*)

C. Clitoris. *L.N.* Labium minus. *L.M.* Labium majus. *Urog.* Urogenital depression. *A.* Anal depression.

behind to the **posterior commissure**. The junction of the internal genital folds anteriorly forms the **prepuce** and **fraenum of the clitoris**.

The **hymen** is developed as a separate structure within the labia minora, and is probably connected with the breaking down of the cloacal membrane, and represents the free edges or remnants of this structure. The hymen certainly does not consist, as was formerly thought, of the fringe left after the Müllerian cords have broken through on to the surface or into the upper portion of the urogenital sinus, for a hymen may be seen when the vagina is either absent or consists only of a urogenital pouch.

CHAPTER II.

THE ANATOMY OF THE FEMALE GENITAL ORGANS.

We must now turn our attention to a study of the structure, naked-eye and microscopical, of the genitalia of woman; and of those structures which, by their close relationship to the genital organs, play a part in many of the morbid conditions which will come under our notice later.

In our anatomical survey, then, we shall study the external genitals or vulva, the vagina, uterus, Fallopian tubes and ovaries, together with their various relations, attachments, and supports.

§ i. GENERAL NAKED-EYE APPEARANCES AND RELATIONS OF THE GENITAL ORGANS.

THE VULVA, VAGINA AND CERVIX UTERI.—With the subject in the lithotomy position (see fig. 324) we are able to examine fully all those parts of the genitalia which are accessible to external inspection.

The vulva (fig. 25) comprises the external genitals, which consist of various parts.

The **labia majora** are spindle-shaped folds of skin enclosing pads of fat. They merge above over the symphysis pubis to form the **mons Veneris,** and gradually taper away below into the **posterior commissure,** which is separated from the anus by the skin covering the **perineum.** In the adult these folds are covered on the outer and anterior aspect with hair, while the inner surfaces are smooth and lubricated by the secretion of many sebaceous glands. The labia majora form the outer boundaries of the vulva, and on separating them we come upon the **labia minora,** which are also folds of skin, somewhat modified in

appearance by the secretions with which they are continually bathed. Above, the labia minora unite to form the **prepuce of the clitoris**—a hoodlike projection—while below the clitoris the labia are connected by the **fraenum clitoridis**. From this point they appear to diverge,

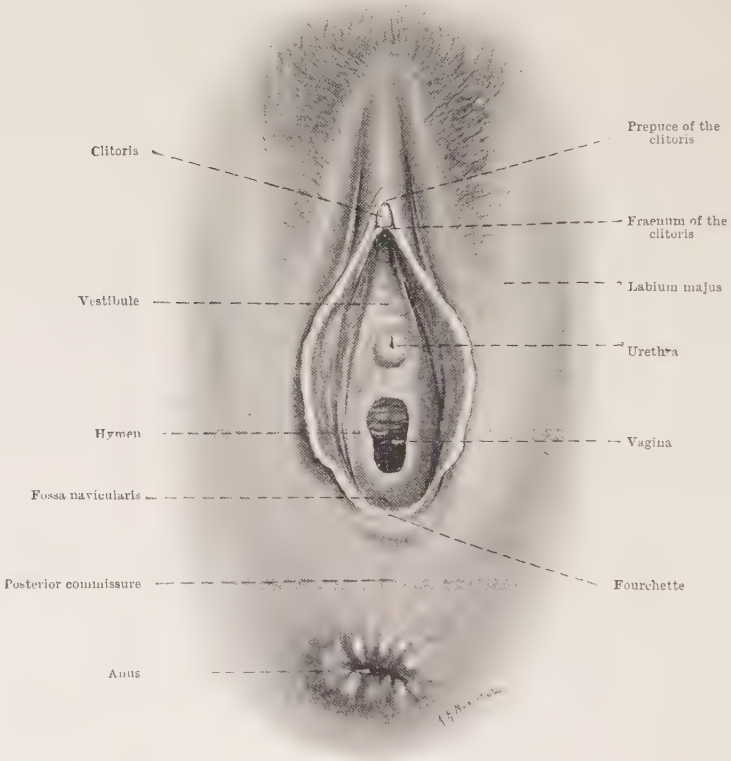

Fig. 25.—External genitals in the virgin.

when separated; but ordinarily on their outer surfaces they are in contact with the inner surfaces of the labia majora, and with one another on their inner aspects. The labia minora protrude most in the middle portion, gradually tapering off below to be lost in the **fourchette** or to merge with the labia majora on each side. The lower limit varies considerably in different individuals. Within the labia minora, when we separate them, we find the **clitoris**, enclosed by the prepuce as already stated, and below this a triangular mucous surface known as the **vestibule**, bounded above by the clitoris with its fraenum; below by the upper margin of the vagina, and laterally by the labia minora. This space is pierced in its centre by the orifice of the urethra.

Semilunar hymen.

Annular hymen.

Cribriform hymen.

Hymen after coitus.

Hymen after parturition, showing the carunculae myrtiformes.

Fig. 26.

running from each anterior angle of the fundus uteri, we can see ridges formed by the **round ligaments**, which disappear at the internal

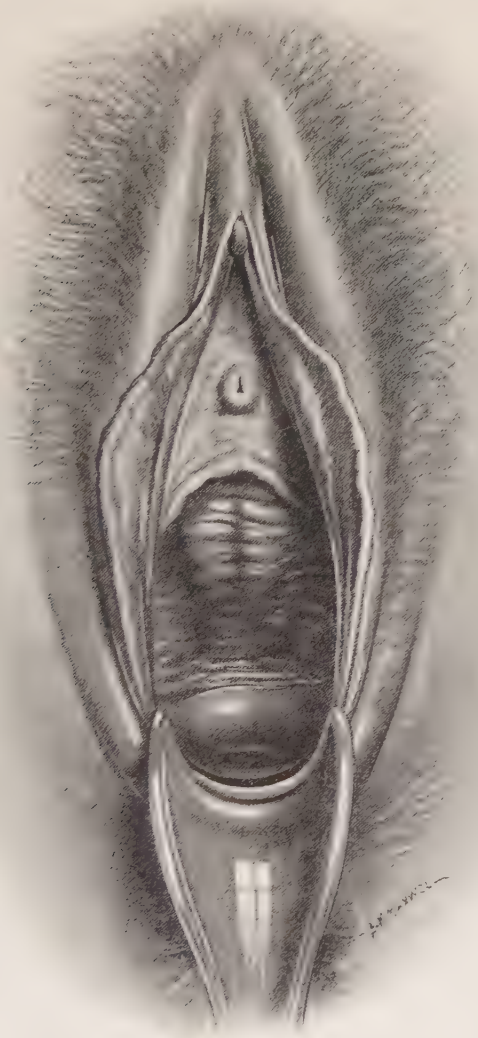

Fig. 27.—The interior of the vagina, as inspected by means of a speculum. The double ridge known as the 'anterior column' is seen on the anterior wall, and the cervix, caught in the speculum and tilted forwards, is seen at the top of the vagina.

abdominal ring. Extending outwards from each side of the fundus uteri, and forming sharp upper boundaries to the broad ligaments which enclose them, are the **Fallopian tubes**, terminating at the outer ends in the 'fimbriated extremities.' Below these the rounded upper

margins of the broad ligament may be traced on to the pelvic brim as the **infundibulo-pelvic ligaments.** It has already been stated that the Fallopian tubes lie in the upper borders of the broad ligaments, so that it is necessary to point out that the 'fimbriated extremities' perforate the peritoneum at the points where the infundibulo-pelvic ligaments commence on each side; hence the relationship described above.

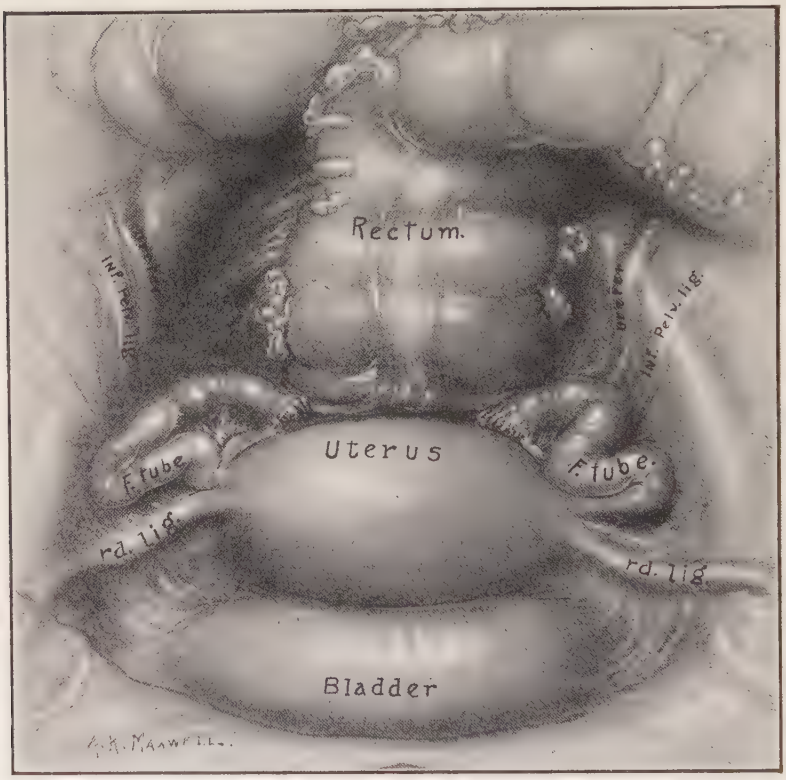

Fig. 28.—View of the pelvis showing the normal position of the female genital organs and their immediate relations.

If we now pull the uterus forwards (fig. 29) we see a deep cavity, which ends below in the cul-de-sac known as the **pouch of Douglas.** This cavity is bounded in front by the posterior surface of the uterus and the posterior layers of the broad ligaments covered with peritoneum. The posterior and lateral boundaries consist of the peritoneum covering the sacrum and rectum. On examining the posterior layer of the broad ligament we find on each side the **ovary** attached to that structure below the Fallopian tube, and connected with the uterus by the **ovarian ligament,** which is, as already mentioned, morphologically the upper part of the round ligament.

Stretching from the lower part of the postero-lateral aspects of the uterus are two folds, known as the **utero-sacral ligaments,** which end posteriorly at each side of the rectum, and constrict the cavity behind the uterus into an upper utero-sacral portion, and a lower recto-vaginal or pouch of Douglas.

The contents of the pelvis are covered—excepting only the ovaries and the ostia of the Fallopian tubes—with a continuous peritoneal coat. Normally small intestine fills the space behind the uterus, and covers the fundus of the uterus and bladder. The caecum on the right side with the appendix, which is frequently found in the pelvis proper,

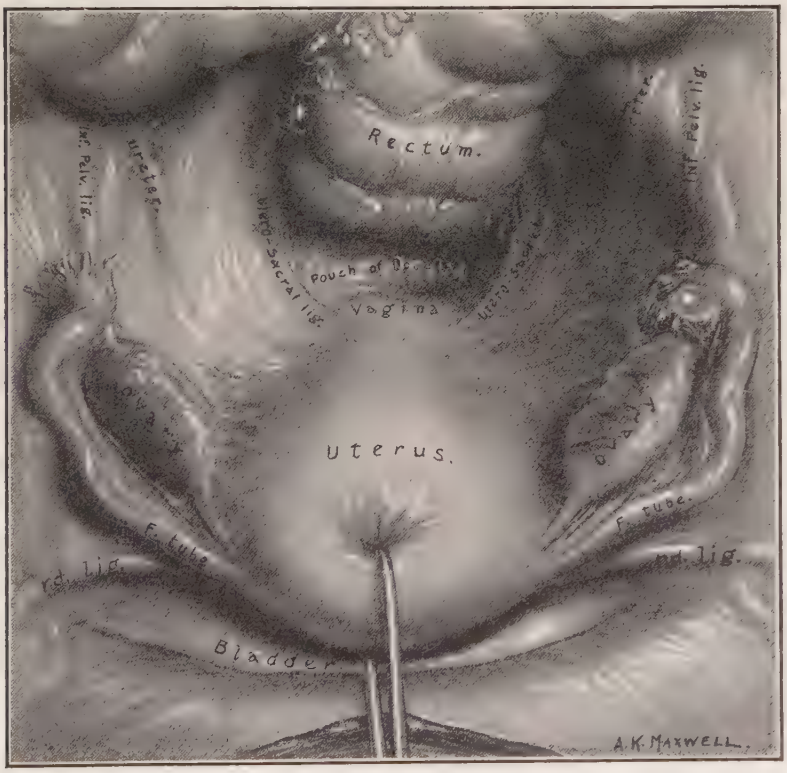

Fig. 29.—View of the pelvis with the uterus pulled forwards, showing the posterior aspect of the uterus and broad ligaments, and the pouch of Douglas.

and the sigmoid flexure on the left, have varying relations with the genital organs according to their degrees of distension and to the length of their mesenteries.

So far our observations have been confined to simple inspection. The rest of the anatomical inquiry will be concerned with the results

of dissections of the pelvis and its contents, and the histological examination of the genital organs.

§ ii. THE BONY PELVIS; THE MUSCLES AND FASCIAE.

THE BONY PELVIS (fig. 30) consists of the ring of bones that serve to protect the pelvic organs, and to form a strong arch through which the weight of the body is transmitted to the thighs.

It is made up of the sacrum and coccyx behind. The former is connected laterally with the ilia on each side at the sacro-iliac joints. The ilia unite in the acetabula with the pubes and ischia on each side to form the ossa innominata. The circle is completed by the junction of the pubic bones in front at the symphysis pubis, which is a slightly mobile joint.

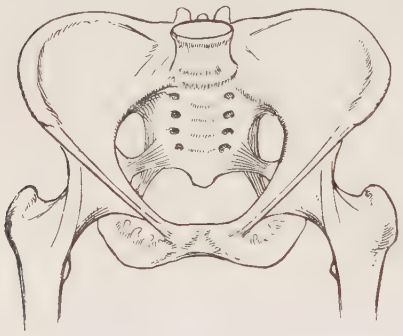

Fig. 30.—The bony pelvis and its ligaments.

The pelvis is divided into two parts. The upper portion, known as the **false pelvis,** lies above the **brim** —indicated by the ilio-pectineal line on each side—and is really only the space enclosed in an ill-defined manner by the wings of the ilia. The **true pelvis** lies below the level of the ilio-pectineal line, which marks the lateral boundary of the brim of the pelvis. It is a cavity definitely enclosed and bounded by bony, fascial and muscular structures. Within the true pelvis all the internal genital organs, together with the rectum, bladder, and lower portions of the ureters, are normally situated.

MUSCLES AND FASCIAE OF THE PELVIS.—The muscles of the pelvis are well defined, and there is no difficulty in tracing their connexions and relations; but until recently the pelvic fascia has been imperfectly understood and described. Instead, however, of being a complicated structure, with all sorts of accessory diverticula that have so long tried the understanding and memory of students, this fascia, which has lately been investigated by many anatomists, has really quite a simple arrangement, and should therefore be set back from an anomalous position in morphology to its proper place. The pelvic fascia is, in fact, no more than an aponeurosis which forms the sheaths of, and gives attachment to the various muscles in this region. It must also be remembered that the same sheet of fascia may in this way separate the surfaces of different muscles, as, for example, the

fascia covering the obturator internus, to which the levator ani is also attached on the inner surface.

What was formerly known as the 'parietal layer of pelvic fascia' is merely the aponeurotic covering of the compressor urethrae, obturator internus and pyriformis, and the 'visceral layer' the pelvic aponeurosis of the levator ani. It is high time that these two terms passed out of anatomical nomenclature. Some authorities describe a 'suspensory ligament' of the urogenital organs, and state that this is formed on each side by a crescentic diverticulum from the aponeurosis of the levator ani; a question that will be briefly discussed directly.

It is obvious that these structures—the muscles and the fasciae of the floor of the pelvis—are of vast clinical importance, for the maintenance of the normal position of the genital organs is dependent upon their integrity; and all scientific operations for the rectification of malpositions (see Chapters VII. and XVI.) should be based as far as possible on an accurate conception of the pathological conditions present and the results thereof.

A dissection of the perineal region, such as is seen in figure 31, shows the muscles of the floor of the pelvis viewed from the lower aspect, and stripped of their fasciae. It will be observed that this region is divided into two parts by the **transversus perinei** muscles, which form the lateral supports of the **central point of the perineum**, into which are inserted also the anterior fibres of the **sphincter ani externus** muscle and the posterior fibres of the **bulbo-cavernosus** muscle. The latter muscle partly forms the sphincter of the vagina.

Fig. 31.—Dissection of the muscles of the female perineum. (*From Cunningham's 'Textbook of Anatomy.' Reduced.*)

The **superficial perineal fascia** which has been removed to expose these structures is thin, and encloses in its fibrous meshes a quantity of fat. Over the anterior half of the perineum it is continuous with the fascia of the labia majora, mons Veneris, and anterior abdominal wall. It is attached to the rami of the pubes laterally, and posteriorly it is continuous with the fascia covering the deep surfaces of the transversi perinei: that is to say with the anterior sheath of the **compressor urethrae** muscle. The superficial fascia of the posterior half of the perineum is continuous with the superficial fascia of the gluteal regions, and fills the ischio-rectal fossa, its meshes being laden with fat—for it must be remembered that the fascia here consists of fibrous strands

interspersed with fat, and it is only on the surface of the levator ani, or other muscles of this region, that an aponeurotic investment is formed. That portion covering the ischio-rectal surface of the levator ani has been known as the 'anal fascia'—a term which should also be dropped.

On removing the muscles in the anterior triangle—the space bounded by the rami of the pubes laterally and by the transversi perinei behind—we come upon a triangular fascial surface which covers the compressor urethrae. This has always in the past been known as the 'anterior layer of the triangular ligament'; the 'posterior layer' being merely the fascia covering the deep surface of that muscle. The dorsal vein of the clitoris passes *over* this structure (fig. 32).

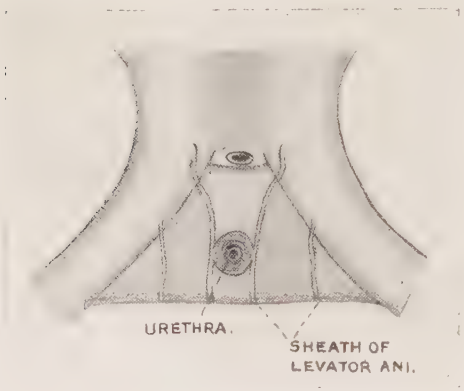

Fig. 32.—Attachments of the sheaths of the levator ani to the pelvic aponeurosis of the compressor urethrae. The dorsal vein of the clitoris is seen passing over the compressor urethrae. (*Cameron, 'Jl. of Anatomy.'*)

In figure 33 is shown a dissection exposing the levator ani muscle on the perineal aspect. From this it will be seen what important structures this muscle and its fasciae are in regard to the support of the pelvic viscera.

A dissection of muscles and fasciae of the pelvic floor from above is somewhat more difficult to illustrate and describe. But even this is not very complicated if we bear in mind the important fact that there are no aponeurotic fasciae except in relation to muscle surfaces, and that—as in other regions, such as the ischio-rectal fossa and the axilla—when fasciae come into relation with large masses of fat, or with blood vessels, lymphatics, nerves and ducts, fibrous bands not only form sheaths for these structures but are scattered through the surrounding fat in a sponge-like fashion. This is an arrangement which is doubtless protective, and therefore 'suspensory', in order that the proper relations of these spaces may be observed during normal movement, compression and so on.

With this introductory comment, let us see what this battlefield of modern anatomists really is, without going into too much detail.

The muscles with which we are concerned in relation to the genital organs are the various parts of the **levatores ani**: the **pubo-coccygeus**,

levator ani and **ischio-coccygeus.** These muscles are on the same plane, and their fibres arise by a wide expanse of surface above, to converge below and form a cup-shaped floor to the pelvis. They are covered on the internal (pelvic) surface by an aponeurosis which, as already pointed out, has been known in the past as the 'visceral layer of the pelvic fascia.'

The **levator ani** arises above from the back of the pubis and the fascia on the internal surface of the compressor urethrae (fig. 32), to which its fascial covering is, of course, also attached. Next, a large portion of the muscle is attached to the fascia covering the internal

Fig. 33.—Deep dissection of the perineal region, showing the outer aspect of the levatores ani.

surface of the obturator internus, and posteriorly to the ischial spine. Now the upper limits of these attachments are marked by a thickened fascial band which indicates the junction of the upper surface of the pelvic aponeurosis of the levator ani and the aponeurosis covering the muscles above this level. This thickened band is known as the **white line**, but it has no very fixed position, and it may vary slightly according to the attachment of the levator ani. In passing, it may be

pointed out that in animals the levator ani and coccygeal muscles are the tail muscles, and arise from much larger surfaces and from as high up in the pelvis as the ilio-pectineal line; hence the 'white line' is peculiar to man. Posteriorly the levator ani aponeurosis is continued

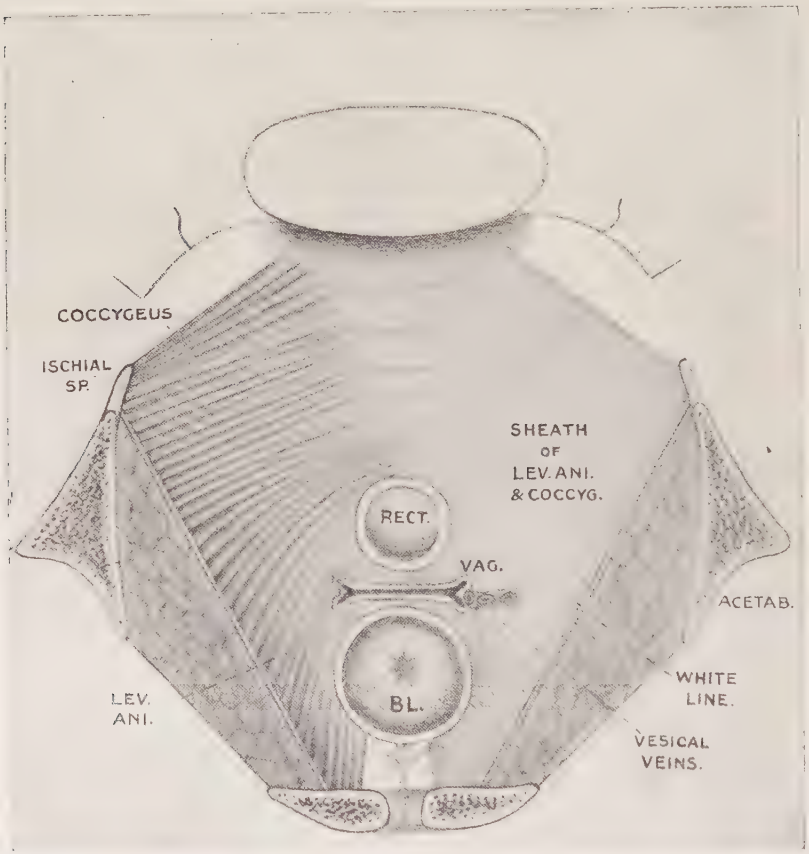

Fig. 34.—Diagrammatic representation of the pelvic aspect of the levator ani and its aponeurosis. (*Cameron, 'Jl. of Anatomy.'*)

to the side and anterior surface of the coccyx, where the fasciae of each side unite in a median raphe. In this way the whole pelvis is lined with a fascial aponeurosis (fig. 34).

If we trace the levator ani muscle and its investing fascia downwards to the pelvic outlet we find that they are attached to the walls of the vagina (which is entirely invested by fascial strands), to the base of the bladder, and posteriorly to the walls of the anal canal (fig. 35). In this way the levator ani is attached to the central point of the perineum and to the ano-coccygeal raphe (figs. 31 and 33).

We must now consider shortly what we have already mentioned as the **perivascular fasciae** and **fat-enclosing fibrous meshes** which are connected with the fascia covering the levator ani, and play such a large part in supporting the pelvic contents. In some places these appear, if the dissector be willing, to form definite ligamentous structures that have given rise to the description of various 'suspensory ligaments.' While these are anatomically accurate, in the sense that they can be so isolated, it is unnecessary to attach definite names to

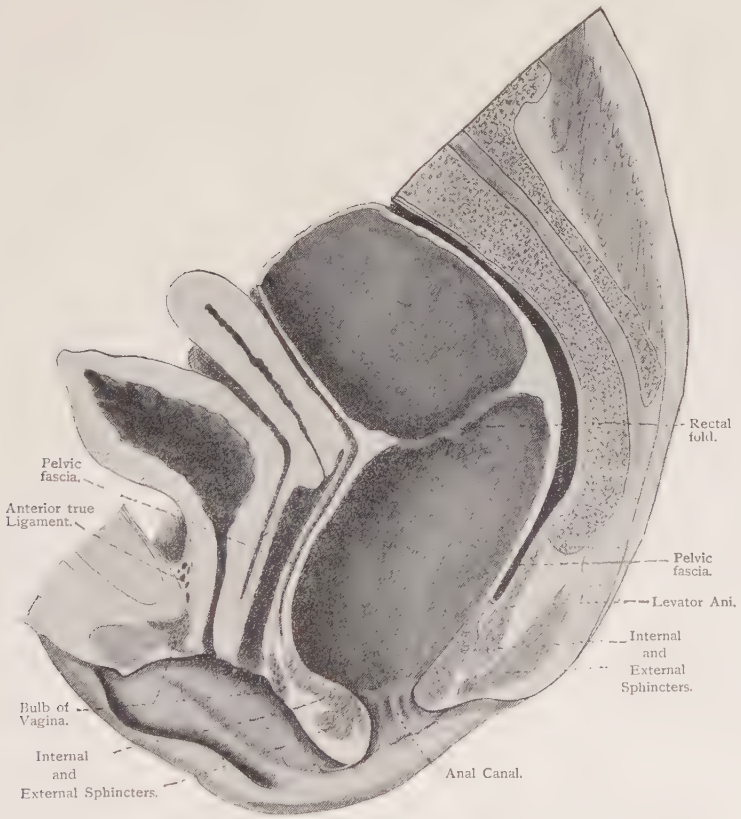

Fig. 35.—Section of the female pelvis showing the relations of the 'pelvic fascia' to the viscera. (*Paterson, 'Jl. of Anatomy.'*)

such parts of the sponge-like arrangement which are more compact, as they necessarily must be, in one part than another.

Within the pelvis, then, we have the genital organs—the uterus, Fallopian tubes and ovaries—separated from the cup-shaped cavity formed by the levatores ani with their covering fasciae, and needing support. This is afforded by the contents of the **broad ligaments**. As we have seen, the broad ligaments are covered by peritoneum.

Beneath this is a delicate layer of subperitoneal muscular tissue—the 'pelvic platysma' as it has been called. In the lower animals this is a well-developed structure and can be seen undergoing regular vermicular movements, but in the human female it affords small support to the uterus. The **round ligaments**, which run from the anterior cornua of the uterus within the broad ligament to the inguinal canals, are hypertrophied bands of the same subperitoneal muscular fibres, and these also give no support; some say that they act as guy ropes to keep the uterus forwards, but even this is doubtful. Within the broad ligament there is a plentiful supply of fat, and this is contained in fascial meshes. So long as this fat remains, and the fibrous 'sponge' is not unduly stretched or damaged, a cushion is provided on each side of the uterus to support it. But in addition there are numerous blood vessels—the uterine and vesical veins and arteries—lymphatics, nerves, and the ureters, which are all protected with fascial investments. The majority of these run across the base of the broad ligament to the cervix, vagina and bladder, and obtain firm attachments to those parts. These fibrous investments, therefore, form a very powerful network of supporting strands. Their strength may be compared to the fine spokes of a bicycle wheel. To a great extent the efficiency of these structures is dependent upon the integrity of the levator ani muscles and their pelvic aponeuroses, with which they are connected.

Such, then, are the facts and principles by which the anatomy of the pelvic supports should be interpreted, and in doing this we must first set ourselves to forget the old nomenclature, and unlearn much that has been taught in the past in regard to these structures.

§ iii. DETAILED MACROSCOPICAL AND MICROSCOPICAL DESCRIPTION OF THE FEMALE GENITALIA.

THE OVARY is a solid organ, which provides the ova for reproduction, and an internal secretion that influences not only the growth and functional activity of the rest of the genital apparatus but also the general metabolism of the body. In size the ovary is about one and a half inches in length and half an inch in thickness. In shape it is an oval, flattened at the sides. In the adult the surface is puckered by the scars left by ruptured follicles. The ovaries are situated on each side of the pelvis, lying in a peritoneal depression known as the **fossa ovarica**; they are directly attached to the posterior layer of the broad ligament by their anterior margins. This portion of the ovary is known as the **hilum**, for it is here that the blood vessels, lymphatics and nerves enter; and the portion of the broad ligament to which the ovary is attached constitutes the **mesovarium**.

The normal position and connexions of the ovary are shown in figure 36. It will be seen that in addition to the attachment to the broad ligament the inner or lower pole of the ovary is connected with the uterus by the **ovarian ligament**, which varies considerably in thickness and in its point of attachment, while the long ovarian fimbria of the Fallopian tube is in close proximity with or attached to the outer and upper pole. The mesovarium at this pole passes insensibly into the **infundibulo-pelvic ligament** which forms the upper border and attachment of the broad ligament. This ligament is merely a fold of peritoneum which contains the ovarian vessels, and is continuous with the parietal peritoneum.

On microscopical examination the ovary is seen to be composed of various elements which are typical of the organ.

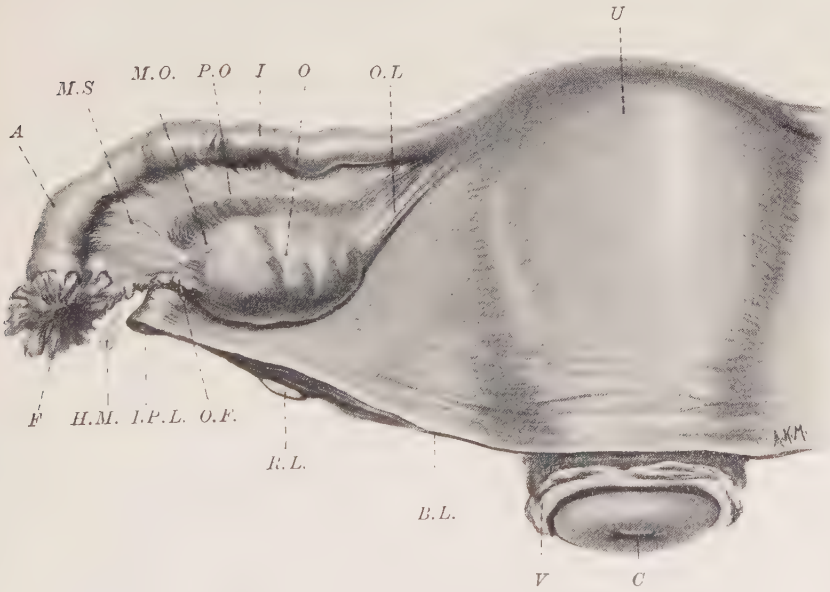

Fig. 36.—Posterior view of the uterus and appendages; the latter are spread out in order to show all the parts.

U. Uterus. *C.* Cervix uteri. *V.* Cut edge of vagina. *B.L.* Broad ligament. *R.L.* Round ligament. *I.P.L.* Infundibulo-pelvic ligament. *I.* Isthmus of the Fallopian tube. *A.* Ampulla of the tube. *F.* Fimbriated extremity. *O.F.* Ovarian fimbria. *H.M.* Hydatid of Morgagni. *P.O.* Straight tube of the parovarium (*i.e.* remains of Wolffian duct). *O.* Ovary. *O.L.* Ovarian ligament; in this specimen attached higher up than usual. *M.O.* Mesovarium. *M.S.* Mesosalpinx.

The surface is covered with a single layer of cubical epithelium—so long known as the '**germinal**' **epithelium**—which merges into the endothelial covering of the peritoneum at the hilum. In later life the ovary loses its epithelial investment. Beneath the epithelium is the connective tissue coat known as the **tunica albuginea**. The interior

of the ovary consists essentially of stroma and Graafian follicles, with, of course, blood vessels, lymphatics and nerves.

The **stroma** is composed of connective tissue which contains spindle-shaped cells and some muscle and elastic tissue fibres (fig. 37), together with a plentiful supply of blood vessels, lymphatics and nerves. In the hilum tubular relics of the Wolffian body may be found, and these are liable to give rise to cysts (p. 342).

The Graafian follicles, in which the ova reach maturity, are not very numerous in the adult, but may be seen near the periphery in

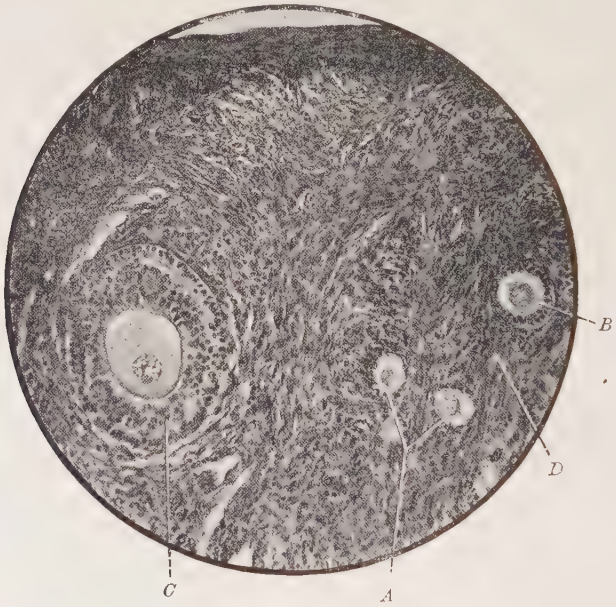

Fig. 37.—Section of the normal human ovary from an adult. In the upper part of the section the surface of the ovary with the tunica albuginea is seen. ×220. (*Photomicrograph.*)

A. Primordial ova surrounded by a ring of spindle-shaped stroma cells. *B*. Early stage of Graafian follicle with the membrana granulosa in a one-cell layer. *C*. Graafian follicle at a later stage in which the membrana granulosa is composed of many layers of cells surrounding the ovum. The liquor folliculi has not yet been secreted. *D*. Stroma of the ovary.

large numbers in childhood. The structure of the Graafian follicle is well seen in figures 37 and 38 A and B. The ovum lies in the centre, surrounded by the cells of the **membrana granulosa**, which are formed, as already stated in Chapter I., from cells in the ovarian stroma. At first there is only a single layer of these cells closely surrounding the ovum, but they gradually increase until many layers deep. The cells of the membrana granulosa appear to rest on a definite basement membrane outside which the stroma cells are arranged in a concentric manner. To these cells of the stroma has been given the name of the

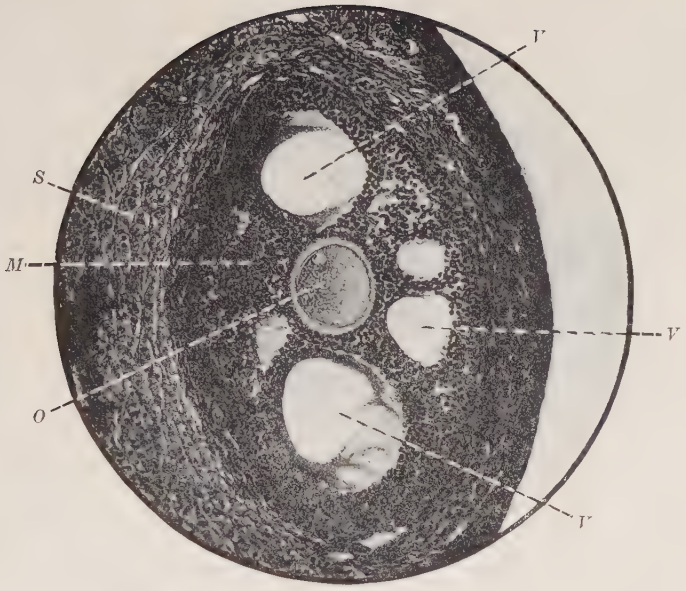

Fig. 38 A.—The ripening of the Graafian follicle (from the rabbit). ×220. (*Photomicrograph.*)

The follicle is near the surface of the ovary. The ovum (*O*) is situated in the centre and surrounded by the cells of the membrana granulosa (*M*). The formation of liquor folliculi is seen proceeding among the cells of the membrana granulosa in various places (*V*). Eventually these collections of fluid merge together. *S*. Interstitial stroma cells surrounding the follicle.

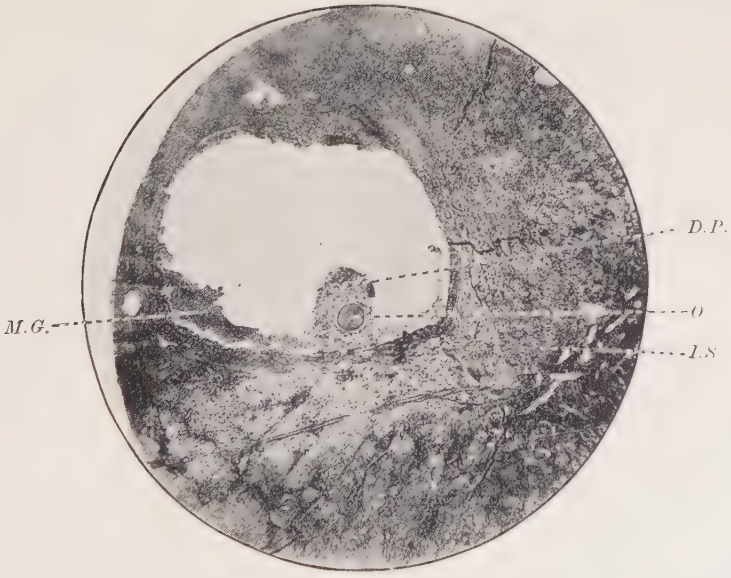

Fig. 38 B.—Ripe Graafian follicle from rabbit's ovary. ×50. (*Photomicrograph.*)

M.G. Cells of the membrana granulosa becoming detached. *D.P.* Cells of the membrana granulosa forming the discus proligerus. *O.* Ovum. *I.S.* Interstitial cells of the stroma

theca folliculi, which has been divided into an internal vascular coat —**theca interna**—and an outer and denser coat—the **theca externa**. A secretion—the **liquor folliculi**—eventually accumulates, and isolates the ovum from the surrounding cells of the membrana granulosa except at one spot. This process has not, however, been very well worked out in the human ovary, and it has usually been supposed that what takes place in the rabbit's ovary (fig. 38) also takes place in the ovary of the human subject, namely, that the liquor folliculi is secreted between the layers of the membrana granulosa, and thus leaves the ovum surrounded by cells—the **discus proligerus**—and attached at one point. The Graafian follicle itself, as stated above, is surrounded by a capsule which is differentiated from the stroma. The minute structure of the ovum concerns embryology, and need not be described here.

The corpus luteum is formed in connexion with the Graafian follicle after rupture and extrusion of the ovum. It is of a yellow colour, and this is much more marked, as is the size of the corpus luteum, when the extruded ovum is impregnated and implantation follows.

The corpus luteum is formed in the following way. After the escape of the ovum the centre of the Graafian follicle is filled with blood clot and cells of the membrana granulosa that have become detached. The wall of the follicle becomes collapsed, and this gives it a wavy outline. Enclosing the central cavity and blood clot are the lutein cells, which are many layers deep; and filling the wavy indentations in the outline of these cells are vascular processes of connective tissue from the ovarian stroma (fig. 39 A). Now whether these lutein cells arise from the cells of the membrana granulosa or the surrounding connective tissue of the ovary (*theca interna*) has been the subject of much dispute. It is, however, a matter of little practical and clinical importance, since the cells of the membrana granulosa itself arise from cells in the ovarian stroma, and this makes it possible for both views to be correct, so that in any case the ultimate origin is from the stroma. The matter would be of more importance, of course, if the follicular cells originated from the 'germinal' epithelium, but this, as has already been stated, is not the case.

Gradually the central area of blood clot disappears, and the lutein cells show great proliferation, and close in on the central cavity (fig. 39 B). Ultimately the lutein cells are destroyed by phagocytes, and nothing remains but an irregular mass of hyaline tissue, known as the **corpus albicans** (fig. 40 A and B). Many of these bodies are found scattered through the adult ovary, and tend to become broken up and ultimately to disappear.

Whether Graafian follicles degenerate without reaching maturity (retrograde or atresic follicles) in the adult human subject, as they do

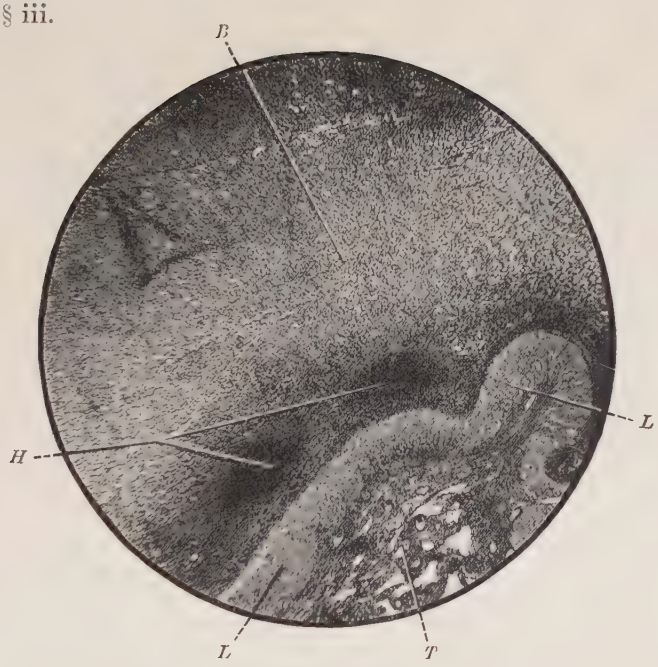

Fig. 39 A.—First stage in the formation of the corpus luteum. ×50. (*Photomicrograph.*)

H. Unaltered blood clot. *B*. Blood clot filling central cavity and undergoing absorption. *L*. Layer of lutein cells which surround the blood clot. *T*. Vascular process of the theca interna.

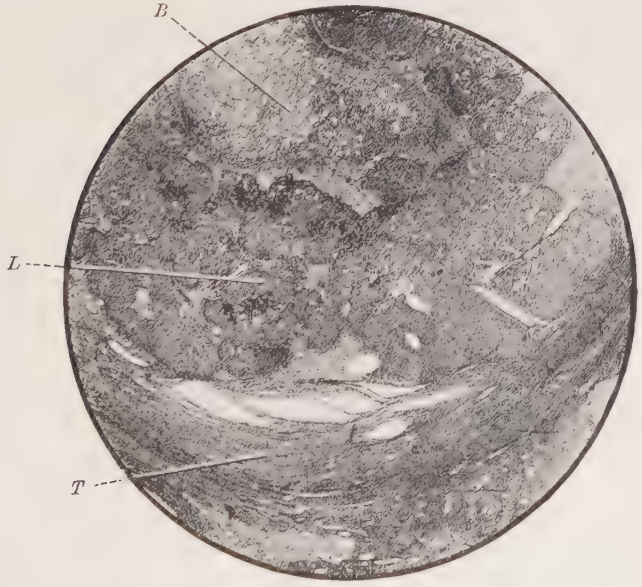

Fig. 39 B.—Second stage of the corpus luteum. ×50. (*Photomicrograph.*)

The central blood clot (*B*) is disappearing and the much convoluted lutein cell layer (*L*) is closing in upon the centre. *T*. Theca externa, which surrounds the corpus luteum.

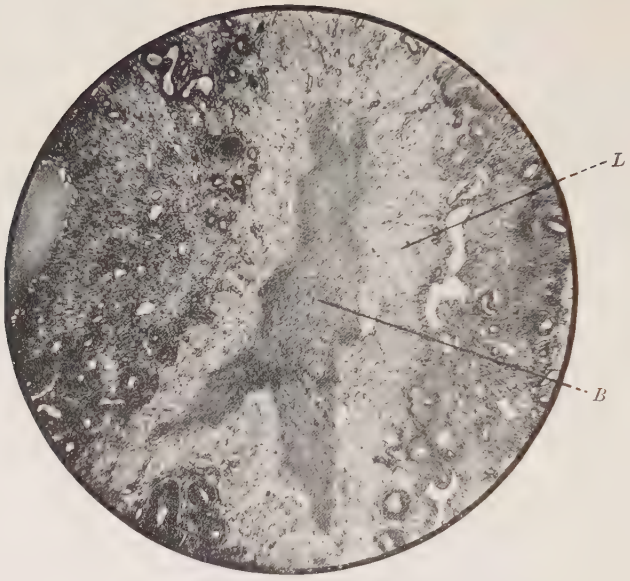

Fig. 40 A.—Third stage of the corpus luteum (corpus albicans). ×50. (*Photomicrograph.*)

The lutein layer (*L*) is in parts becoming hyaline, and the remains of the central blood clot (*B*) are shrinking in size.

Fig. 40 B.—Third (late) and fourth stages of the corpus luteum (corpus albicans). ×50. (*Photomicrograph.*)

The third stage (on the left) shows the corpus albicans, as it has now become, still showing some of the convolutions of the lutein layer (*L*) but almost hyaline in structure. In the centre the last remnants of the blood clot can be seen (*B*). On the right two completely hyaline corpora albicantia (*A*) are seen. Eventually these are broken up and scattered throughout the ovary.

in rabbits, is doubtful. In any case such a process must be very rare. It has, however, been shown to occur before puberty.

THE FALLOPIAN TUBES form the oviducts by which the ova, after escaping from the Graafian follicles, are conveyed to the uterine cavity. They are about four inches in length, and run on each side, in the upper border of the broad ligament which forms the **mesosalpinx**, from the pelvic brim to the lateral horns of the uterus. They terminate at the outer end in a **fimbriated extremity** (fig. 36), having the appear-

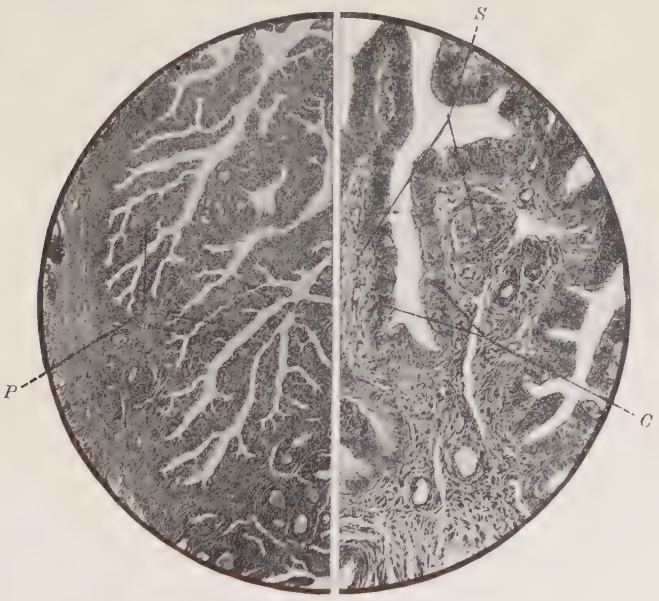

Fig. 41.—Normal Fallopian tube. (*Photomicrograph.*)

On the left is seen a low power section (× 20) in which the plicae, or folds of the mucous membrane (*P*), are seen to be very complicated. On the right side is a higher power magnification (× 100) of some of the plicae showing their loose connective tissue stroma (*S*) and the ciliated columnar epithelium (*C*) covering them.

ance produced by the tentacles of a sea-anemone. As already stated, the Fallopian tubes perforate the peritoneum at their extremities. The fimbriae surround a trumpet-shaped depression known as the **infundibulum**, at the bottom of which is placed the **ostium abdominale**, or the entrance proper to the canal of the tube. The fimbriae are covered on the inner surface with mucous membrane which is continuous with that lining the tubes, and on the outer surface with peritoneum.

Within the ostium abdominale we come upon the widest part of the tube—the **ampulla**. This ends in the thicker walled **isthmus** near

the uterus, while the last part of the canal, known as the **pars uterina**, passes through the wall of the uterus.

Structure of the Fallopian tube.—Each tube is covered with peritoneum, underneath which is loose connective tissue containing blood vessels, lymphatics and nerves. Beneath this again we come upon the muscular stratum composed of two layers of muscle fibres—an outer longitudinal, and an inner circular layer. Within the muscular stratum is a submucosa of delicate connective tissue, and finally there is a mucous lining which is thrown into longitudinal folds or plicae (fig. 41). The mucous membrane is thicker and more plicated near the ostium abdominale than it is at the uterine end, and the converse is the case in regard to the thickness of the muscular stratum. On section the mucous membrane appears as a branching and fern-like structure, which, as already indicated, is more complex in the ampulla than near the uterus. The surface of the mucous membrane is covered with ciliated columnar epithelium.

THE UTERUS is the hollow muscular organ from which the menstrual discharge takes place and in which conception normally occurs. It is situated in the pelvis between the bladder in front and the rectum behind. In the adult the length is about three inches; the breadth about two inches; and the maximum antero-posterior diameter one inch.

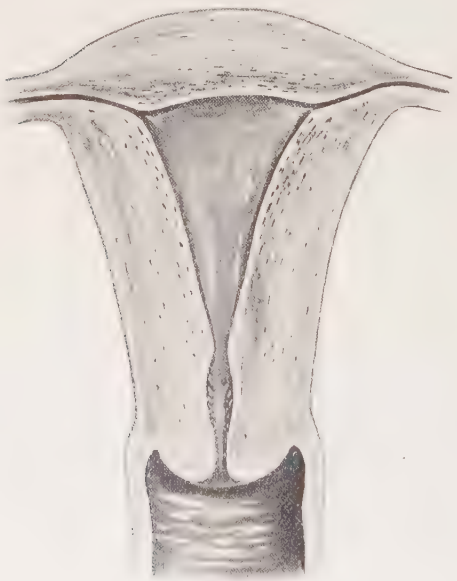

Fig. 42.—Sectional view showing the cavity of the uterus and cervix and the attachment of the vagina, in a multiparous woman. (*Reduced.*)

In shape the uterus is roughly pear-shaped; that is to say, the bulkiest portion is the upper extremity or **fundus** (fig. 42). This gradually tapers in the mid portion, or **body**, towards the **cervix**. The upper part composed of the fundus and body is flattened in front and rounded behind, while the cervix is cylindrical. The uterus is covered by peritoneum over the fundus and the anterior surface of the body as far as the utero-vesical pouch, the line of peritoneal reflexion being about the level of the junction of the cervix with the body. Posteriorly

the peritoneum is continued down until it is reflected backwards to form the floor of Douglas' pouch, just above the level at which the vagina joins the cervix in the posterior fornix. Laterally the peritoneum on each side extends out to form the anterior and posterior layers of the broad ligament and become continuous with the parietal peritoneum of the pelvic and abdominal walls.

The division of the lower portion of the uterus, or the cervix, from the body is indicated by a slight constriction known as the **isthmus**.

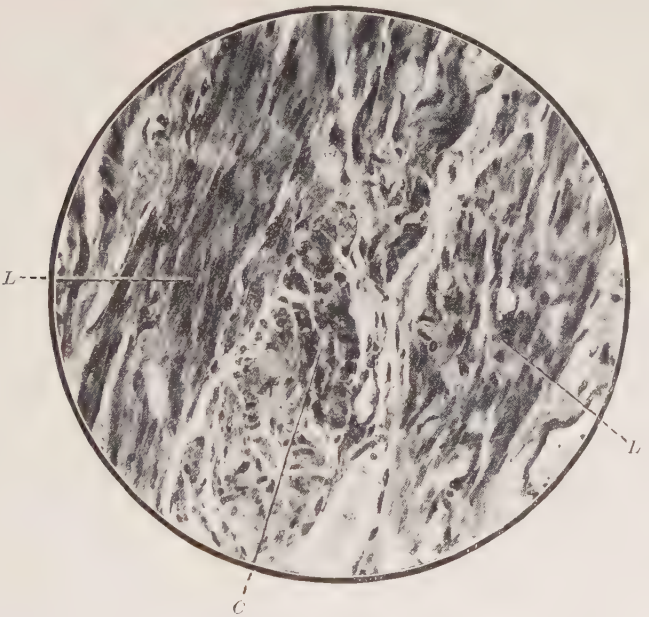

Fig. 43.—High power view of a section of the involuntary muscle fibres of the uterus. ×300.

L. Muscle fibres running longitudinally. *C.* Muscle fibres cut in cross section.

The internal point at which the cervix opens into the uterine cavity is known as the **os internum**, and the opening of the cervix into the vagina as the **os externum**. The **cervix** is therefore divided into a **supravaginal** portion, lying between the junction of the vagina with the cervix and the os internum, and a **vaginal** portion, which projects as a nipple-shaped process into the vagina (fig. 42).

The **cavity of the uterus.**—This is divided, as already stated, into two portions—the cavity of the body and the cervical canal. Both are lined with a mucous membrane known respectively as the endometrium and the mucous membrane of the cervix. The former presents a smooth appearance to the naked eye, while the latter has a longitudinal ridge anteriorly and posteriorly, from which other ridges branch off

laterally, producing the appearance described as the **arbor vitae** (fig. 42). The cavities of the uterus and cervix are potential rather than actual. The former is somewhat triangular, with the orifices of the Fallopian tubes situated at the upper lateral angles. The cervical canal is spindle-shaped. In length the uterine cavity measures from about 2 inches in the young nulliparous adult to $2\frac{3}{4}$ inches in the parous woman.

Structure of the uterus.—If we cut a section through the body of the uterus we come upon the following structures.

The **serous coat** formed by the peritoneum, which is peculiar in regard to its investment of the uterus in that it is incorporated over the fundus and posterior wall with the underlying structures, from which it cannot be stripped. This is due to the fact, already mentioned, that the subperitoneal muscular tissue, which is continued into the broad and utero-sacral ligaments, forms the outer layer of the muscular coat of the uterus.

The **muscular coat**, consisting of unstriped muscular fibres (fig. 43), constitutes the main bulk of the organ. In addition to the muscular bundles, connective and elastic tissues are also to be seen. The

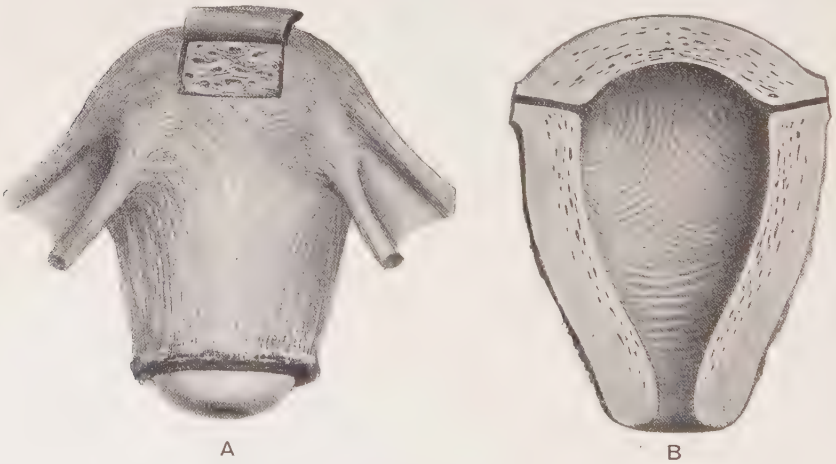

Fig. 44.—Semidiagrammatic representation of the disposition of the muscle fibres in the uterus—best seen in the pregnant organ.
A. External longitudinal coat derived from the subperitoneal muscle fibres. A flap has been raised at the fundus to show interlacing fibres round the blood vessels.
B. Internal circular coat. The merging of the circular coats from the Fallopian tubes into one circular coat of the uterus is shown.

muscular coat is said to consist of three layers; an outer, with a hood-shaped arrangement of its fibres; a middle, with interlacing fibres; and an internal, or circular layer. It is probable, however, that this

statement, based on dissections rather than morphological and evolutionary grounds, is erroneous.

In the uterine cornua of animals, just as in the Fallopian tubes of the human subject, there are only two layers of muscle fibres, as has already been illustrated in fig. 19, p. 18. And there are really no grounds for presuming the presence of a third layer simply because the outer set of fibres is not regular in disposition. As we have already seen, the decussating subperitoneal fibres cover the Müllerian ducts, which have a circular muscular coat of their own, and give rise to an interlacing external coat. Consequently there are really *two*, not three, muscular layers in the uterus, the usually described middle and external coats being one and the same layer morphologically. In figure 44 the disposition of the muscular fibres is depicted.

The **mucous coat** (endometrium) is a very important structure, and plays a prominent part in the functions of menstruation and conception. The elements of the **endometrium** (fig. 45 A and B) consist of a loose connective tissue stroma, containing stroma cells, glands, thin-walled blood vessels, lymphatics and sympathetic nerves. The surface is covered with ciliated low columnar epithelium, which is continuous with the epithelium (columnar but not ciliated) lining the glands. These glands are produced by invagination from the surface, as is well illustrated by comparative anatomy, if, indeed, it is not obvious from a study of the human endometrium (cf. fig. 48).

The glands vary in complexity and arrangement in different individuals, and on section (sagittal to the surface of the endometrium) are seen to present a spiral and tubular arrangement (fig. 45 A). They all open on the surface, although, of course, in any one section all the orifices are not cut through. In a section cut parallel with the surface we see the gland tubules cut across (fig. 45 B). The glands are of considerable length, running from the surface to the deepest part of the endometrium, which is usually about $\frac{1}{20}$th of an inch in thickness. The terminations of some of the glands may even be found in the muscle wall, there being no submucosa.

It must be carefully borne in mind that the appearance and thickness of the endometrium vary considerably according to the relation of the particular specimen to menstruation, and, of course, to pregnancy, when the muscular wall is also altered (see Chapter III.).

A **section across the cervix** (fig. 46) shows us that the muscular structure is not so evident as in the wall of the uterus, and that here we find a larger amount of elastic and dense connective tissue. Further, we see that the mucous membrane lining the cervical canal is more compact, and contains less loose connective tissue in the stroma. The glands, too, are fewer in number, and while some may be tubular,

Fig. 45 A.—Normal endometrium cut in vertical section. ×75. (*Photomicrograph.*)

E. Surface columnar epithelium: this is seen to be continuous with that lining the glands. *G.* Glands cut in vertical section; some are seen opening into the uterine cavity.

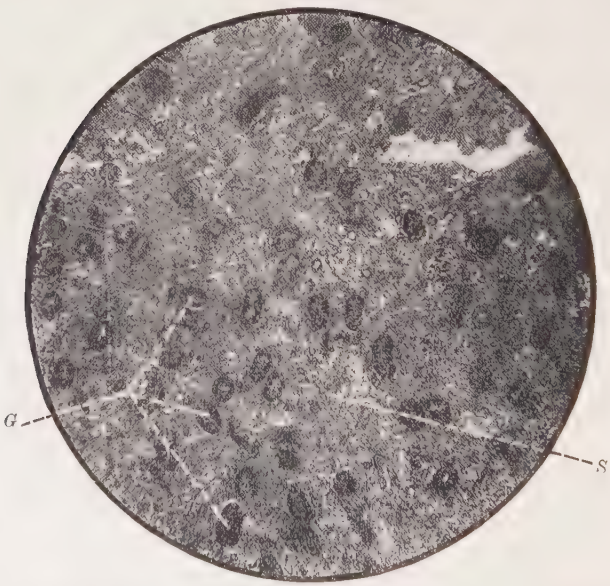

Fig. 45 B.—Normal endometrium cut in cross section. ×75. (*Photomicrograph.*)

There are a moderate number of glands (*G*) lined with columnar epithelium, and a loose connective tissue stroma (*S*) containing stroma cells.

like those in the body of the uterus, most are racemose or branching glands which are peculiar to the cervix. The epithelium of the mucous membrane is columnar and ciliated (except in the glands):

Fig. 46.—Section of the cervix, showing dense, almost fibrous, stroma and the two types of cervical glands containing secretion. ×75. (*Photomicrograph.*)

A. Stag antler formation. *B*. Ordinary racemose formation.

in comparison, however, with the columnar cells lining the uterus, those in the cervix are much higher and narrower, and their nuclei are basal. The cervix is covered on the vaginal surface with squamous epithelium.

Age differences in the uterus.—It is worthy of note that the uterus in childhood is different in structure and appearance from the adult organ, and this again from the senile (fig. 47). In infancy the cervix is longer than the body, and the internal os is not marked. The *arbor vitae* at this age extends from the cervix right up the body of the uterus; the endometrium is also comparatively dense, and the glands are mere surface invaginations (fig. 48). The structure of the uterus, too, is different. In infancy the muscular coat is usually riddled with large blood spaces, giving the organ the appearance of erectile spongy tissue. Later in life the body of the uterus gradually comes to

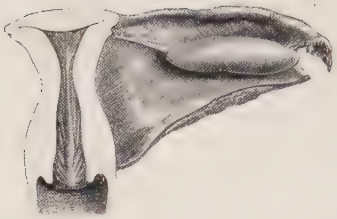

Fig. 47 A.—Uterus with vaginal attachment and appendages and broad ligament of the right side, from a child aged eighteen months. (*Natural size.*)

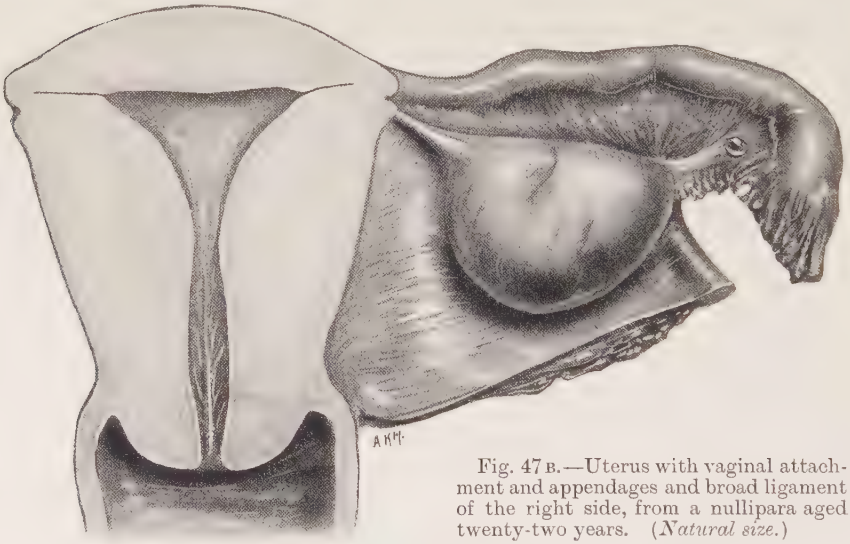

Fig. 47 B.—Uterus with vaginal attachment and appendages and broad ligament of the right side, from a nullipara aged twenty-two years. (*Natural size.*)

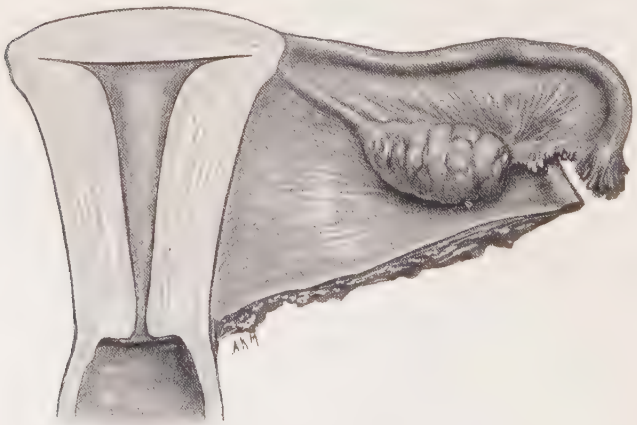

Fig. 47 C.—Senile uterus with appendages on the right side. (*Natural size.*)

conform with the adult type; for it is the body, rather than the cervix, that undergoes alteration as puberty appears. In old age the whole uterus atrophies and decreases in size in a more or less regular manner; and all the tissues undergo fibrosis (see fig. 78, p. 90).

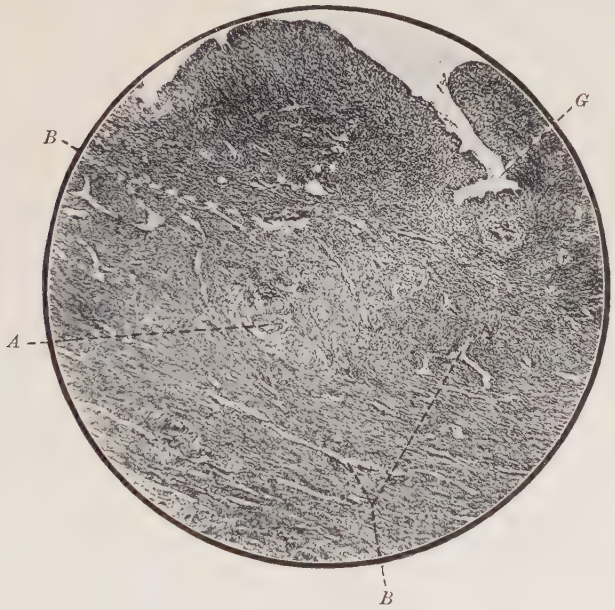

Fig. 48.—Section of the endometrium and muscle wall of the uterus from a child aged eighteen months. × 120. (*Photomicrograph.*)

G. Tubular invagination of the endometrium to form a gland. *A.* Group of arteries. *B.* Blood spaces.

THE BROAD LIGAMENT AND ITS CONTENTS.—The formation of the broad ligament has already been described, but it is necessary to consider in a little fuller detail the contents of this structure and their relations to one another.

In regard to the general outline. This varies somewhat according to the position of the uterus and the amount of fat contained between the two layers. Normally the upper part of the anterior surface is curved forwards, with the concavity looking downwards; and the posterior surface in the upper part is parallel to the anterior. The lower parts of the anterior and posterior surfaces hardly correspond with the usually described outline, but figure 49 illustrates the conformation as it appears during life, to the surgeon. This section, which is through the broad ligament close to the uterus, also diagrammatically represents some of the relationships existing between the various

contents. It will be seen that the Fallopian tube occupies the upper angle. The round ligament lies under the anterior surface. It may be mentioned in passing that structurally the round ligament is composed of involuntary muscle fibres, fibrous tissue, connective tissue, blood vessels, lymphatics and nerves (fig. 50). Below, in the base of the ligament, the ureter and uterine vessels are shown.

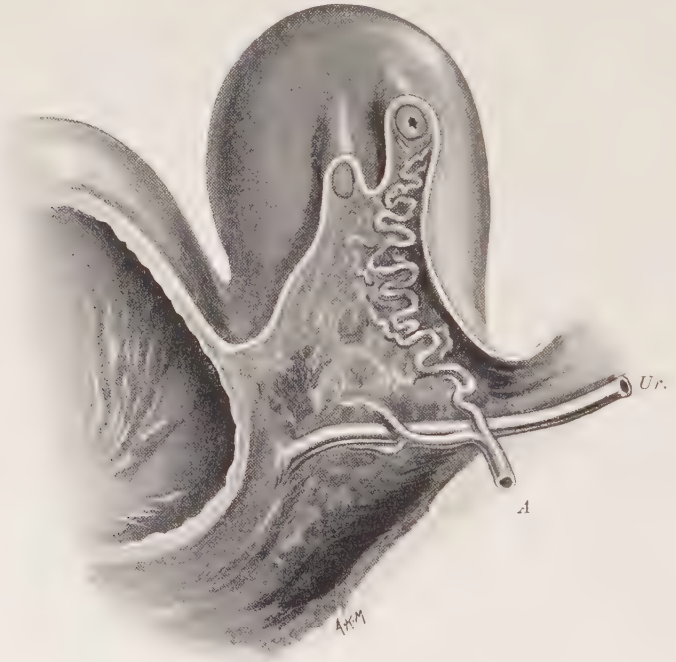

Fig. 49.—Semidiagrammatic section to show the outline of the broad ligament near the uterus, and the relations of the ureter and uterine artery.

A. Uterine artery. *Ur*. Ureter.

In figure 51 the broad ligament is shown spread out on the flat to display the developmental remains which have already been mentioned in Chapter I.

The **parovarium** (*epoöphoron*, or *organ of Rosenmüller*) lies in the mesosalpinx, between the Fallopian tube and the hilum of the ovary, and consists of a series of tubules, some of which (*Kobelt's tubules*) are attached only to **Gartner's duct** (Wolffian duct), others run from the hilum of the ovary to the remains of Gartner's duct, which can be seen traversing the broad ligament parallel with and below the Fallopian tube. This duct is usually lost at the side of the uterus. Hanging from the pelvic extremity of the parovarium small cysts of

Kobelt's tubules are sometimes seen. These must be distinguished from the **hydatid of Morgagni**—also derived from Wolffian relics—which, when present, is attached to, or below, the fimbriae of the Fallopian tube.

Sometimes the **paroöphoron** may also be seen. This is a collection of rudimentary tubules lying nearer the uterus. Microscopically these

Fig. 50.—Section of the round ligament showing numerous bundles of muscle fibres (*M*). ×100. (*Photomicrograph.*)

tubules are seen to be atrophied. They are lined with columnar (non-ciliated) epithelium like Gartner's duct and the parovarian tubules.

The fat, enclosed in the fibrous trabeculae, which fills the space between the two layers of the broad ligament, has already been discussed.

The **ureter** has very important relations with the broad ligament, which must be fully understood in view of their immense importance in operative procedures. As the ureter crosses the common iliac artery to get into the pelvis (fig. 52) it runs in close apposition to the posterior layer of the broad ligament. When it reaches the base of this, it turns forwards and inwards (fig. 49), enclosed in a special fibrous sheath. As the ureter passes the supravaginal cervix of the uterus—at a distance of about one half of an inch away—it passes below the uterine arteries and veins, to reach the base of the bladder.

The vessels, lymphatics and nerves of the broad ligament will be described in the next section.

THE VAGINA is the passage extending from the hymen to the uterus, and includes the vault that surrounds the cervix uteri. It is the channel by which the contents of the uterus are voided; into which the male organ penetrates during coitus, and in which the semen is deposited. The posterior wall is longer than the anterior, the latter being three to three and a half inches in length and the former about an inch longer.

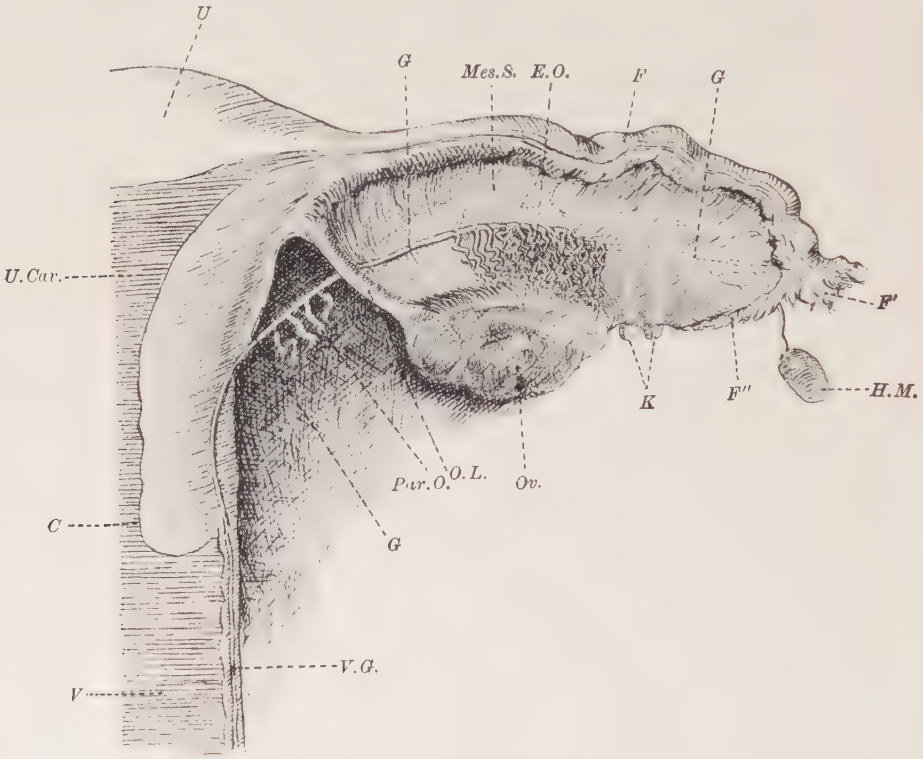

Fig. 51.—Posterior view of the uterus and appendages, with the remains of the Wolffian duct and its tubules. (*After Cullen.*)

U. Uterus. *U.Cav.* Uterine cavity. *C.* Cervix. *V.* Vagina. *Ov.* Ovary. *O.L.* Ovarian ligament. *F.* Fallopian tube. *F'.* Fimbriated extremity of Fallopian tube: *F''.* Ovarian fimbria. *Mes.S.* Mesosalpinx.

Relics of the Wolffian duct: *H.M.* Hydatid of Morgagni. *G.G.G.* Main part of Wolffian duct in broad ligament and uterus. *V.G.* Wolffian duct in vaginal wall. *K.* Kobelt's tubules. *E.O.* Epoöphoron. *Par.O.* Paroöphoron.

The axis of the vagina forms an angle of about 60° with the normal direction of the uterus. The passage is much wider and more capacious at the top than it is in the middle and lower parts. Normally the channel is only a potential one, for the walls lie in apposition. Owing to the relative mobility and flaccidity of the anterior and posterior walls and relative fixation of the lateral walls, the former fall together

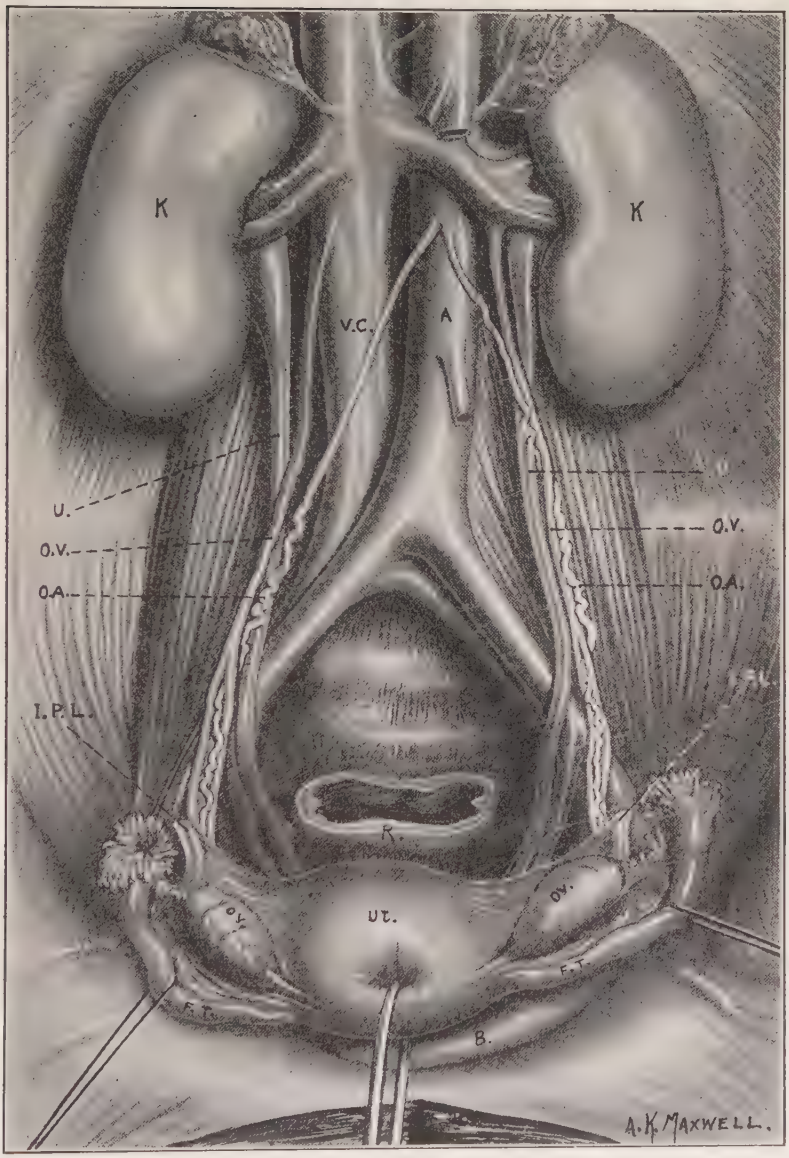

Fig. 52.—Dissectional view of the posterior abdominal wall and pelvis to show the relations of the ureters and the chief blood vessels.

K. Kidneys. *A.* Aorta. *V.C.* Vena cava. *U.* Ureters. *O.V.* Ovarian veins. *O.A.* Ovarian arteries. *I.P.L.* Infundibulo-pelvic ligaments. *Ov.* Ovaries. *Ut.* Uterus. *F.T.* Fallopian tubes. *B.* Bladder. *R.* Rectum.

and the latter remain on the stretch; so that if a section be made across the vagina, the cleft is seen to be H-shaped, or, rather, like a cotton-reel (fig. 53).

The relations of the vagina are important, for it is only separated from the bladder and urethra in front, and from the rectum behind, by connective tissue, which contains bundles of muscle fibres and strands of fascia from the aponeurosis covering the levator ani muscles. Laterally the vagina is firmly fixed by dense fascial strands of similar origin. At the vault of the vagina a similar state of affairs exists, and the perivascular fasciae of the numerous blood vessels, and the peri-ureteral fasciae are firmly attached by fibrous offshoots. The lowest part of the vagina is separated from the anus by the so-called 'perineal body,' which is merely the inclusive name for a triangular mass of tissue containing the muscles and fasciae arising around the central point of the perineum (already described), fat, blood vessels, lymphatics, nerves and some involuntary muscle fibres.

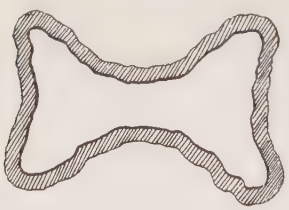

Fig. 53.—Sectional view of vaginal canal, with the walls separated.

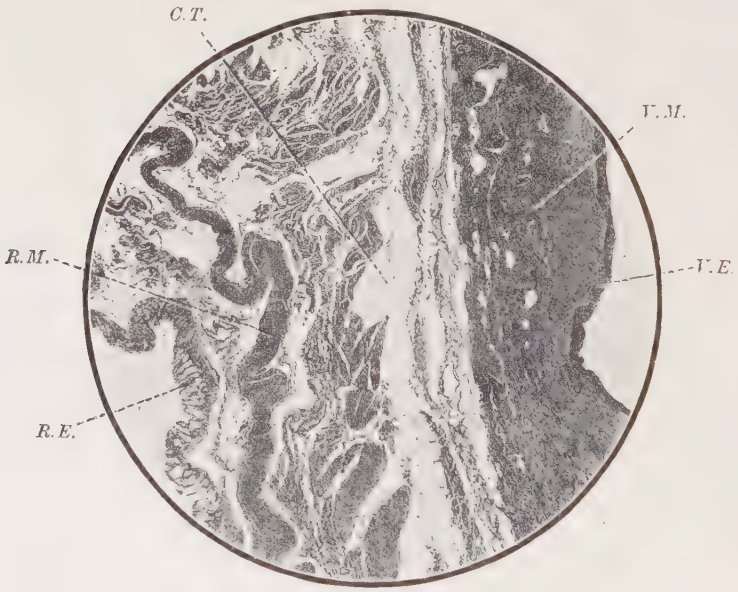

Fig. 54.—Low power view of a section through the adjacent walls of the vagina and rectum. × 10. (*Photomicrograph.*)

V.E. Stratified epithelium covering the vagina. *V.M.* Muscle wall of the vagina. *C.T.* Loose connective tissue separating vagina from rectum. *R.M.* Circular muscle fibres, within the horizontal layer (cut in cross section), surrounding the rectum. *R.E.* Columnar epithelium and glands in the mucous lining of the rectum.

Structure of the vagina.—As already indicated, the vagina is surrounded by an investment of muscular and fascial offshoots con-

taining blood vessels. Within this is a coat of involuntary muscle fibres, running for the most part longitudinally, but in the lower part concentrically as well. Next we come upon a connective tissue investment with papillae protruding from it into the squamous epithelial lining. Few or no glands are found in the vagina, although crypts are sometimes seen. Figure 54 represents a section

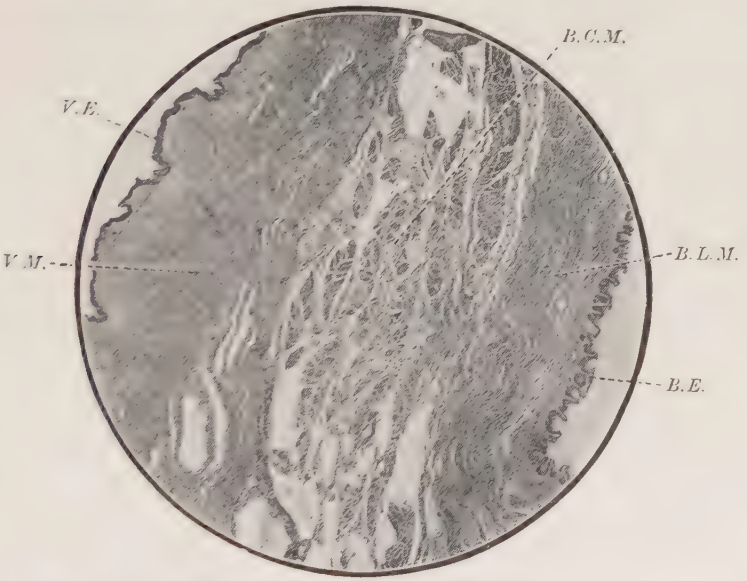

Fig. 55.—Low power view of a section through the adjacent walls of the bladder and vagina. ×10. (*Photomicrograph.*)

B.E. Transitional epithelium lining the bladder. *B.L.M.* Inner longitudinal muscular coat of the bladder. *B.C.M.* Circular muscular coat of the bladder. *V.M.* Muscle wall of the vagina. *V.E.* Stratified epithelium covering the vagina.

through the posterior wall of the vagina including the rectum, and figure 55 a similar section through the anterior wall including the bladder.

THE EXTERNAL GENITALS, THEIR STRUCTURE AND THE RELATIONS OF THE DEEPER PARTS. The appearances and relations of superficial parts have already been described, but a description of the deeper structures and the microscopical appearances of the parts is now necessary.

The **hymen.**—As we have already seen, this structure is situated at the orifice of the vagina. A microscopical section (fig. 56) shows that it is composed of rather dense connective tissue, with blood vessels and nerves, and covered on both sides with squamous epithelium.

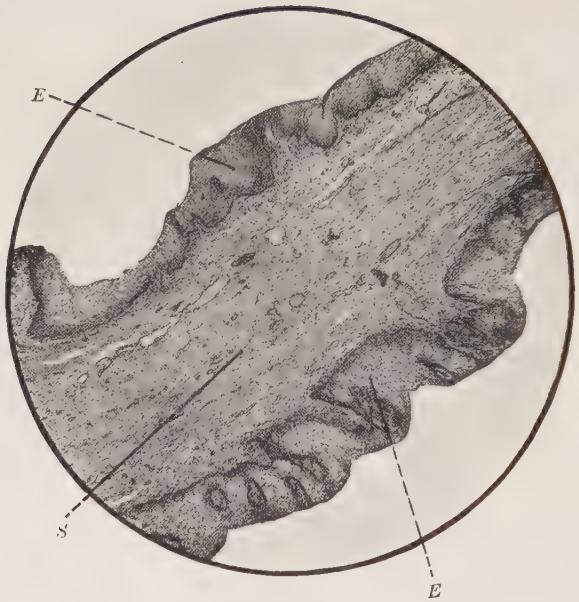

Fig. 56.—Section of the hymen, showing the stratified epithelium (*E*) on each surface and the connective tissue stroma (*S*), which is fairly dense, but contains some large blood vessels. ×40. (*Photomicrograph.*)

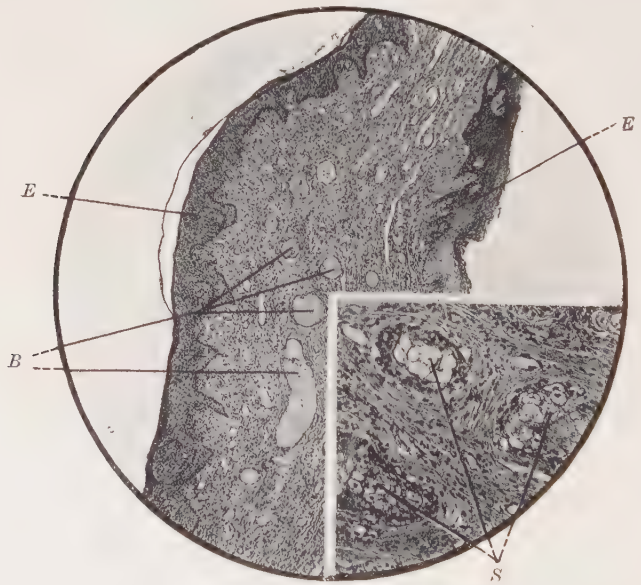

Fig. 57.—Section of the labium minus (×40). Both surfaces are covered with stratified epithelium (*E*), and the loose connective stroma contains many large blood vessels (*B*). Inset is a high power view of some sebaceous glands (*S*) at the base of the labium minus (×150). (*Photomicrograph.*)

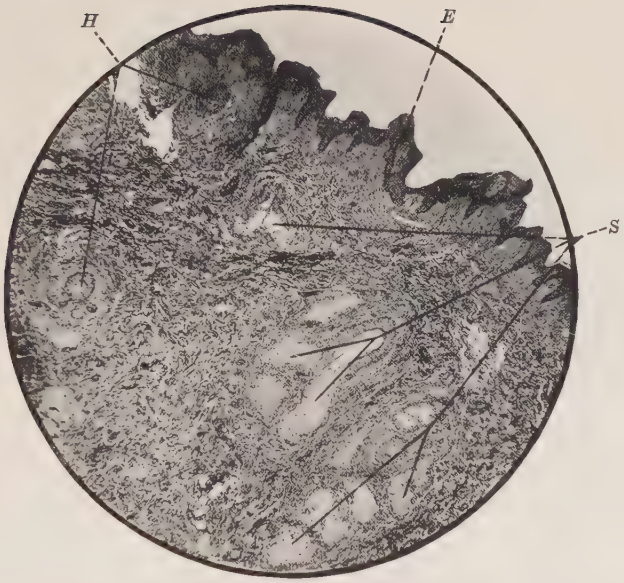

Fig. 58.—Section of the labium majus showing the covering of stratified epithelium (*E*), and subjacent connective tissue containing hair follicles (*H*) and many sebaceous glands (*S*). ×75. (*Photomicrograph.*)

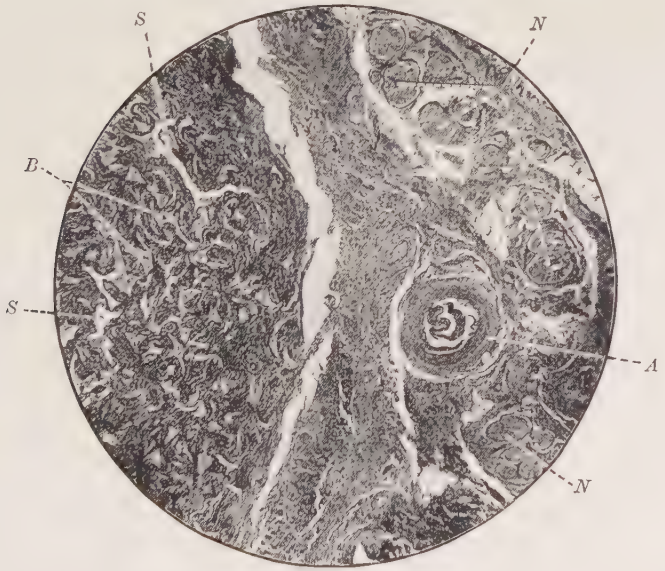

Fig. 59.—Section through the clitoris. On the left is seen the corpus cavernosum which is made up of fibrous and elastic tissue trabeculae enclosing large blood spaces (erectile tissue). Some of the spaces still contain blood (*B*), but it has fallen out of others (*S*) in the process of cutting the section. To the right is seen the dorsal part of the clitoris with the dorsal artery (*A*) and many dorsal nerve bundles (*N*). ×50. (*Photomicrograph.*)

The **labia minora.**—On microscopical examination (fig. 57) these are found to have a squamous epithelial covering, enclosing loose connective tissue, blood vessels and blood spaces, which constitute an erectile tissue. In addition, at the base there are a number of large sebaceous glands which constantly lubricate the parts. These are best seen in middle-aged women; in young girls they are fewer in number.

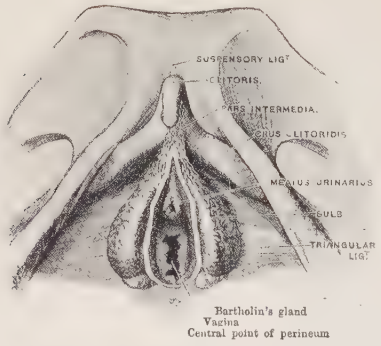

Fig. 60.—Dissection of perineum showing the bulbus vestibuli. (*From Cunningham's 'Textbook of Anatomy'* (*reduced*).)

The **labia majora**, forming the outer boundary of the vulva, and representing the scrotum in the male, are covered with ordinary skin, and contain fat and loose areolar tissue. On the inner apposed surfaces the sebaceous glands are very numerous (fig. 58).

The **clitoris**, which is the morphological homologue of the penis, is composed of a body and two crura, one on each side. The body ends in the glans clitoridis. Histologically the body is seen to be composed of erectile tissue, while the glans clitoridis is covered with squamous epithelium, and is well supplied with sensory nerves (fig. 59).

In relation with these superficial external genitals we have deeper structures of considerable importance. These are well displayed in the dissection shown in figure 60.

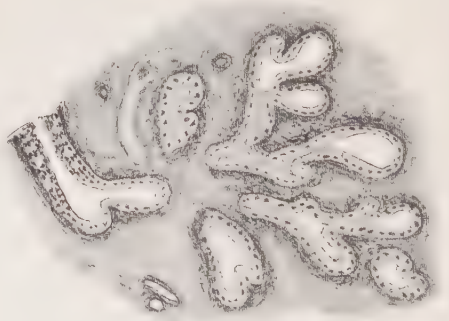

Fig. 61. Terminal branches of Bartholin's gland. Note the columnar epithelium is somewhat cubical in character. (*Winter and Ruge, 'Gynäkologische Diagnostik.'*)

The **bulbus vestibuli** consists of erectile tissue (that is, a mass of cavernous blood spaces and vessels connected by fibrous tissue) situated on each side of the entrance to the vagina beneath the bulbo-cavernosus muscle. This structure is the homologue of the corpus spongiosum in the male. Each lateral mass is connected in front by the pars intermedia.

The **glands of Bartholin** lie at the posterior end of the bulbus vestibuli on each side (fig. 60). They represent Cowper's glands in the male. They are somewhat of the size and shape of a bean. The

ducts are long and narrow, and open on the surface on each side in the lower angle between the labia minora and the hymen. Microscopically these glands are seen to be of the ordinary racemose variety (fig. 61).

THE URETHRA.—Although not part of the genital apparatus the female urethra needs some short description, since, owing to the dissimilar conformation of the parts, it differs from the corresponding passage in man.

It is a channel one and a half inches in length, connecting the bladder with the exterior. It is situated between the lower boundaries of the symphysis pubis above and the anterior vaginal wall below. As it leaves the pelvis it is surrounded by the compressor urethrae muscle with its two fascial aponeuroses (previously known as the 'two layers of the triangular ligament'). The external orifice is situated in the centre of the vestibule (fig. 25).

The urethra is composed of a muscular coat of longitudinal and circular fibres which are continuous with those of the bladder. Within the muscular coat is a submucous coat of very vascular areolar tissue surrounding the mucous membrane which lines the canal. This last structure is thrown into longitudinal folds, and is lined in the upper part with transitional epithelium like that of the bladder, and in the lower part with squamous epithelium. Numerous mucous glands open into the canal. In addition to these, the glands of Max Schüller—situated between the urethra and vagina—open by long ducts into the lower third of the urethra. These may give rise to cysts in the anterior wall of the vagina.

§ iv. THE BLOOD, LYMPHATIC AND NERVOUS SUPPLY.

BLOOD SUPPLY. Arteries.—The *external genitals* are supplied by the **superficial external pudic artery**, a superficial branch of the femoral, and by the **internal pudic artery** which is one of the parietal branches of the anterior division of the internal iliac. The internal pudic artery emerges from the pelvis between the pyriformis and the coccygeus muscles, and lies in the buttock, under cover of the gluteus maximus, on the spine of the ischium. Turning forwards, the internal pudic artery enters the perineum by passing through the small sacrosciatic foramen. In the first part of its course in the perineum it lies in the fascia (Alcock's canal) covering the outer wall of the ischiorectal fossa. Several branches are given off in the anterior part of the perineum to supply the muscles and structures contained therein.

These are the transverse perineal artery, the superficial perineal artery, the artery to the bulb and the dorsal artery of the clitoris. The superficial external pudic supplies the mons Veneris and the labia majora.

The *internal genital organs* receive their arterial supply from the **ovarian arteries**, both of which arise usually from the aorta, but occasionally the left comes from the renal artery; and from the **uterine arteries**, which are given off from the anterior division of the internal iliac arteries.

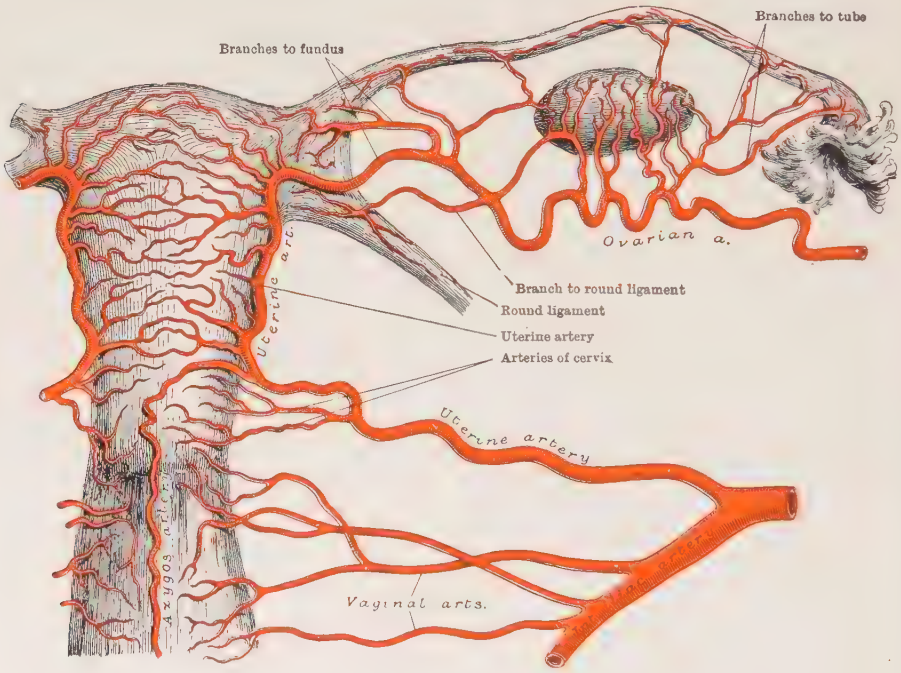

Fig. 62.—The arteries of the internal organs of generation in the female. (*After Hyrtl, from Gray's 'Anatomy.'*)

The course of the ovarian artery is shown in figure 62. It is contained in the infundibulo-pelvic ligament, and in this way enters the broad ligament. Before terminating by anastomosing with the final branches of the uterine artery, the ovarian artery gives branches to the ovary, Fallopian tube and round ligament.

The course of the uterine artery is illustrated also in figures 49 and 62. Before crossing the ureter to reach the body of the uterus it gives off various branches to the cervix, and sometimes to the vagina. By some of these branches a special azygos artery is formed, and this runs down the front and back of the vagina in the mid-line. Tracing the main trunk of the uterine artery on to the uterus we observe

that it turns upwards, and runs a corkscrew-like course up the side of that organ, giving off penetrating branches to the muscular wall on the way. Finally, as already stated, the uterine artery anastomoses with the ovarian.

The **vagina** is supplied by branches from the anterior division of the internal iliac and often by branches from the uterine artery.

Veins.—The veins in the pelvis are for the most part collected into plexuses which open into the main tributaries.

The **veins of the labia** pass into the pudic vein, and thence into the internal iliac.

The **veins from the clitoris and bulb** pass into the vesical and vaginal plexuses.

The **vesical plexus** lies external to the muscular coat of the base of the bladder, and is especially in evidence at the points where the ureters enter that viscus.

The **vaginal plexuses** surround the vagina outside the muscular coat. They communicate freely with the haemorrhoidal and vesical plexuses. These three plexuses—the vesical, vaginal and haemorrhoidal —with the pudic veins, join the internal iliac veins, which themselves open into the common iliac veins and so into the inferior vena cava. In reaching their destination these plexuses focus, by their afferent trunks, in the base of the broad ligament.

The **uterine plexus** corresponds to the branches of the uterine artery, except within the uterine muscle, where blood spaces are formed under certain circumstances. The uterine veins empty into the **pampiniform (ovarian) plexuses,** and thus indirectly into the ovarian veins, which join the inferior vena cava on the right side and the renal vein on the left.

LYMPHATICS.—The lymphatics of all parts of the **vulva** and of the **lower part of the vagina,** which it will be remembered is developed from the urogenital sinus, pass through the **inguinal glands** (fig. 63), consequently malignant growths and infections of these parts are liable to spread to these glands.

The lymphatics of the **upper part of the vagina** and **cervix** pass out into the base of the broad ligament through the small glands to be found there, in some cases including also the obturator gland, and then into the **iliac glands** situated at the bifurcation of the common iliac artery. Lymph channels connect these with the lumbar glands higher up.

Lymphatics of the **body of the uterus, ovaries** and **Fallopian tubes** all pass into the main channels accompanying the ovarian vessels in the infundibulo-pelvic ligament. Thence they travel direct to the **lumbar glands.**

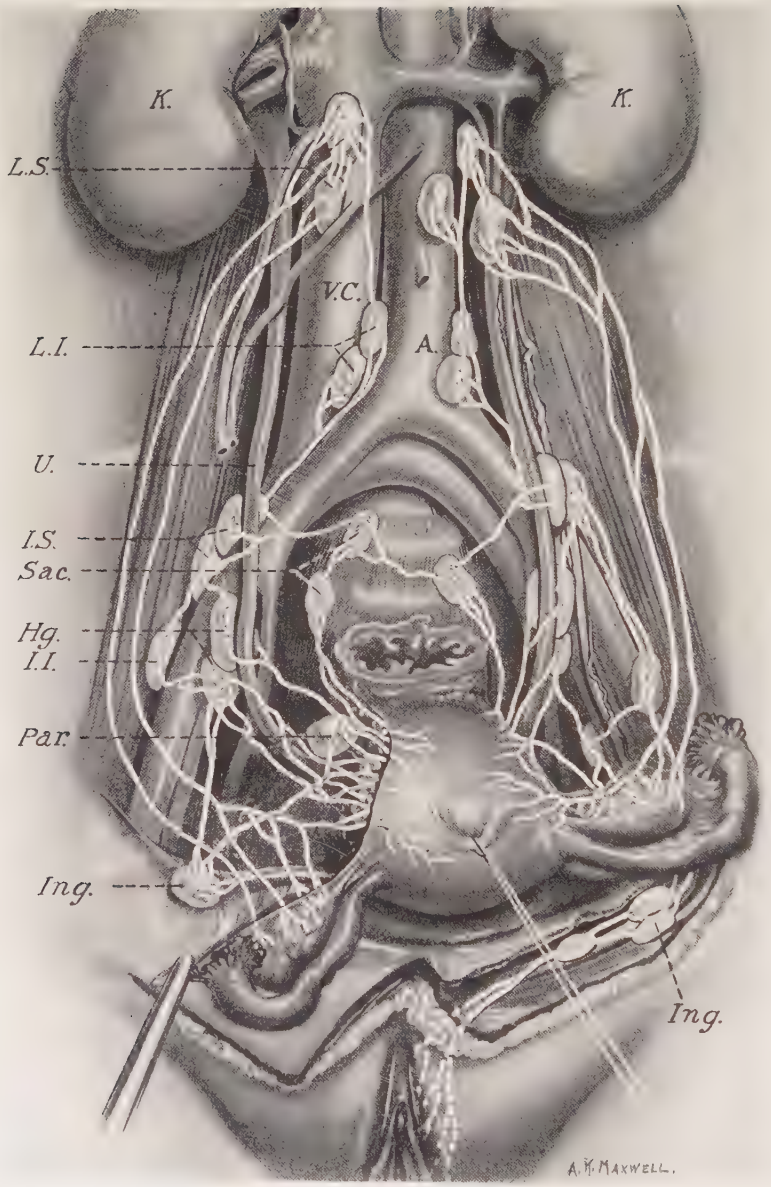

Fig. 63.—The lymphatics connected with the female genital organs. (*Modified from Döderlein and Krönig.*)

K. Kidneys. *V.C.* Vena cava. *A* Aorta. *U.* Ureter. *Ing.* Inguinal glands, shown in connexion with the vulva on the left side, and with the lymphatic channels along the round ligament on the right side. *Par.* Gland in the parametrium. *I.I.* Inferior iliac glands. *Hg.* Hypogastric glands. *Sac.* Sacral glands. *I.S.* Superior iliac glands. *L.I.* Inferior lumbar glands *L.S.* Superior lumbar glands.

Lymphatics of the **uterine cornua** and **round ligaments** are connected with the **inguinal glands** (fig. 63).

NERVES.—The genital organs proper—the ovaries, Fallopian tubes, uterus and vagina—are supplied by the sympathetic system.

The **ovarian plexus** is derived from the aortic plexus, and accompanies the ovarian artery to the broad ligament, whence it is distributed to the ovary, Fallopian tube and broad ligament itself, wherein it forms connexions with the uterine plexus which originates in the pelvic plexus. The latter are the direct continuations, on each side of the rectum, of the hypogastric plexus, itself a continuation of the aortic plexus.

The **uterine plexus** follows the uterine artery, and is distributed to the muscular walls of the uterus.

The **vaginal plexus** also originates in the pelvic plexus, and supplies the wall and mucous membrane of the vagina and urethra. At the same time this plexus supplies the **cavernous plexus** of the clitoris and bulbus vestibuli. It is said that organs supplied by sympathetic nerves are, in themselves, insensitive to pain, yet by virtue of their white *rami communicantes* which connect them with the posterior roots of the spinal nerves, pain from them is communicated to the sensorium. But the impression conveyed is that this pain arises in the superficial skin area supplied by the spinal sensory nerve connected with the sympathetics from the viscus concerned. The ovarian plexus is in communication with the tenth dorsal nerve, and the pelvic plexus with the second to the fourth sacral nerves. Head, working on these lines, defined the skin areas which may be tender or painful according to the visceral part affected. These areas are shown in detail in figures 84, 85, 86, 87, pp. 102 and 103, in so far as the female genital organs are concerned, and need not be discussed further, except to emphasize the fact that they may be of diagnostic importance (see Chapter IV.).

While the sympathetic system supplies nerves to the essential organs of generation, the superficial parts of the vulva are supplied by spinal nerves. The **pudic nerve,** which is a mixed nerve, arising from the second, third and fourth sacral nerves, gives off branches to the muscles of the perineum, including the levator ani, and to the skin covering the lower part of the vulva. The upper parts of the vulva—mons Veneris and labia majora—are supplied by the inguinal branch of the **ilio-inguinal nerve,** which arises from the first lumbar nerve. The genital branch of the **genito-crural nerve** is found in connexion with the round ligament in the inguinal canal.

CHAPTER III.

THE PHYSIOLOGY OF THE FEMALE GENITAL ORGANS.

We have followed briefly the course of Evolution and the development of the genital organs in woman, and we have seen how the greater complexity of function found in the higher mammals has been met by greater complexity of structure. We next considered the anatomy of the genital organs, and having thus made ourselves familiar with the machine we must now see the purposes to which it is put. This will be made the more intelligible by occasional references to comparative physiology, for which we have prepared ourselves by touching upon the gradual evolution of the genital organs in Chapter I.

The physiology of the genital organs of woman is, of course, mainly concerned with menstruation, conception and the concomitant phenomena; but before going on to discuss those important but intermittent functions it will be advisable to consider very briefly the ordinary secretions of the various parts.

§ i. THE NORMAL SECRETIONS OF THE GENITAL ORGANS AND TRACTS.

The ovaries are organs which not only provide the ova concerned in reproduction (see page 78), but also produce an internal secretion just as do the other ductless glands. This secretion, how elaborated we do not know for certain, is taken up by the lymphatics or blood stream, and utilized in the general metabolism in a way to be indicated shortly. Physiologically the action of ovarian secretion is probably very much like that of the thyroid, and antagonistic to that of the

adrenals and infundibular portion of the pituitary body. Metabolically, then, the internal secretion of the ovary assists in keeping the balance of the metabolism as regulated by the ductless glands, and it seems to exercise a specific effect on the calcium metabolism, probably in conjunction with other properties.

The Fallopian tubes normally secrete an albuminous and saline fluid, which serves to separate the plications in the interior of the tube, and to nourish the ovum in its passage to the uterus. This secretion is colourless and of low specific gravity.

The body of the uterus normally secretes a clear and watery mucinous fluid, which is very slight in quantity except during menstruation. This secretion is produced by the glands of the uterus.

The cervix of the uterus secretes by means of its mucous glands a transparent, thick and viscid discharge. The quantity produced, apart from menstruation and conception, is not large normally. The secretions of the uterus and Fallopian tubes are alkaline in reaction.

The vagina contains a thin, clear discharge. Since there are no glands in the vagina, or at most very few, the discharge must be produced by a process of transudation. In reaction it is acid—due, it is said, to lactic acid produced by the vagina bacillus (Döderlein). There are numerous cast-off epithelial cells in the 'secretion' from the vagina, which is, of course, mixed with the secretions of the upper genital passages.

The vulva.—The normal secretions of the vulva arise from two sources.

(*a*) **Bartholin's glands**, which lubricate the vulva during coitus. The secretion is viscid and clear, and contains much mucin.

(*b*) **Sebaceous glands** and **sweat glands**, which give rise to the same secretions as elsewhere on the skin surfaces.

Later we shall have to mention 'leucorrhoea' as a symptom (see also Appendix II. § iv.), so that it is necessary to explain here that 'leucorrhoea' or 'white discharge' is, strictly speaking, merely a pathological excess and alteration of the normal secretions.

§ ii. THE MENSTRUAL FUNCTION.

Until recent years menstruation was thought to be a phenomenon peculiar to the human race. Since that idea has been exploded, and we now recognize in the 'rut' or 'heat' of female mammals lower in

the scale a stage which is comparable to human menstruation, we have been able to learn much in regard to the nature of this function. Menstruation in girls usually commences in England between the ages of eleven and fifteen years, at the period of life known as puberty. Sometimes menstruation may make its appearance earlier or a year or two later, and still be within normal limits. As this epoch draws near changes are to be observed in the girl both in regard to her mental and physical characteristics.

Mentally she becomes more shy and reserved—the 'Tom-boy' disappears into the Juliet; modesty takes the place of innocence; her outlook on life becomes more curious, and she no longer accepts everything at its apparent value. The mysterious changes that are taking place in her spread their shadow over the whole range of her life. These changes in varying degrees affect the children of the poorer classes no less than those of the rich and cultivated. From time immemorial this period of life has been regarded as a critical one, and with girls of hypersensitive natures much care and tact are needed lest they become hysterical or introspective.

While the altered metabolism of the body is producing these wonderful changes of character and disposition, others none the less remarkable, are taking place in the structures of the body. The child becomes a woman.

The first alterations to be noticed are a growth of hair on the mons Veneris and in the axillae, and a gradual enlargement and rounding of the breasts. A little later, fat is deposited in greater quantities than before in certain portions of the body—the buttocks and thighs, the mons Veneris, the breasts, shoulders and neck. There is often, too, a general tendency to roundness and plumpness—features distinctly feminine and attractive. Such are the general changes.

Locally the genital organs develop. The uterus enlarges and conforms with the adult rather than the infantile type; that is to say, the relative proportions of the cervix and body of the organ change. The body becomes large, and longer than the cervix which was, in earlier life, longer than the body. In the ovaries, too, changes are taking place. Instead of a large number of primordial ova—ova unsurrounded by the cells of the membrana granulosa—fully matured ova are chiefly to be found. It is probable that ovulation, that is the discharge of ripe ova, occurs at irregular intervals before puberty, for there are many instances on record of impregnation before the onset of menstruation; but there is no doubt that the full development of the ovary, with the periodic discharge of ova and the subsequent formation of corpora lutea, is reached at puberty. These stages can be easily

traced in the rabbit's ovary. In the rabbit of a few weeks old the ovary consists of a mass of primordial ova; later a number of these disappear and mature Graafian follicles are to be seen. As sexual maturity is reached the ova seem to be fewer in number, while the stroma becomes almost entirely composed of polygonal cells known as interstitial cells, which undoubtedly give rise to an internal secretion.

In the human ovary the same changes occur, except that the interstitial cells are not developed in the same way and to the same extent. Although there is undoubtedly an internal ovarian secretion which is indirectly and partially responsible for the general and local changes at puberty, we have not as yet been able to determine its source of origin in the human female beyond surmising that it is produced by the islets of altered stroma cells. Nevertheless it is certain that the internal secretion of the ovaries influences metabolism in a similar way to that of the other ductless glands. It is supposed that the ovarian secretion is specifically responsible for the secondary characteristics of the female. Further it is largely responsible for the development and subsequent activity of the uterus.[1]

At puberty the external genitals become pigmented, covered with hair as far as the inner margins of the labia majora, and more fully developed. In children the prepuce frequently protrudes; in young adults it is more completely hidden by the enlarged labia majora.

What exactly these changes are that take place in the general metabolism, and produce such wonderful results, is not yet agreed upon. It is at least clear, however, that the ductless glands *all* participate largely in the altered conditions. The only ductless gland accessible to ordinary observation is the thyroid, and there is no doubt that this organ plays an important part in the production of menstruation, and the metabolic processes that lead to the establishment of that function. Any careful observer can satisfy himself on this point—that in young girls the thyroid gland is nearly always definitely enlarged just before and during menstruation. From experimental work carried out upon the subject it appears probable that the calcium metabolism, under the direction of the ovaries and other ductless glands, is also concerned in the phenomenon of menstruation. The experimental work done, and all the reasons for this view, are too complicated and extensive to be completely dealt with here. The main points which it is necessary to enumerate—for the treatment of

[1] The removal of the ovaries leads first of all to atrophy of the *muscle fibres* in the uterus, and this is a process which follows uterine inactivity—*i.e.* absence of uterine contractions.

certain disorders of the menstrual function is dependent upon them—can, however, be shortly summarized:

(1) The calcium salts are necessary for the repair of all lesions, therefore the presence of menstruation is dependent upon a healthy condition of the organism as a whole, and its claims on the calcium metabolism at any particular time. For instance, menstruation is generally absent during lactation, when large quantities of calcium salts are required for the milk.

(2) Uterine contractions are, like other involuntary muscle contractions, largely dependent upon the calcium salts circulating in the blood.

(3) Calcium salts have a powerful effect on the vasomotor system, which is greatly affected during menstruation and the menopause.

The menstrual discharge.—The principal outward and visible sign that sexual maturity has been reached is the menstrual discharge. This usually recurs every twenty-eight days, but women vary to some extent in this respect, so that occasionally women have been found to menstruate normally as often as every twenty-one days, others as infrequently as every forty-two.

At the outset menstruation is apt to be irregular, and girls frequently menstruate once or twice, and then do not 'see anything' for two or three months. It is most important that young girls should not be overworked mentally or physically at this period, as will be pointed out in a later chapter.

When properly established the menstrual discharge should last from three to five days. It has been estimated that about six ounces of fluid are lost normally at each period. The character of the discharge varies throughout its course and in different individuals. For the first twenty-four hours it is slight, and of a pale pink colour. This discharge is particularly rich in mucin, and under the microscope it is found to be full of leucocytes. Gradually the exudation becomes bright red, and consists largely of blood. Under the microscope at this stage all the elements of blood are seen, together with large vaginal epithelial cells and the cells of the endometrium which lines the uterus. After the third day the bleeding ceases, and the discharge becomes a dirty brown colour, and decreases in quantity; gradually it becomes less and less, until there is only a little leucorrhoeal excretion or clear mucus to be seen.

Local changes in the genital organs during menstruation.—It is generally stated and accepted that there is a great increase in the vascularity of the whole genital apparatus during menstruation. This

is undoubtedly the case in animals, but according to the observations of those who have performed abdominal operations during menstruation in the human subject engorgement of the pelvic vessels is not always noticeable. It may be taken, then, that the local signs in the human subject apart from the discharge are not very marked, and that they are more marked in adolescence than in later life.

When there are marked changes, the external genitals may be swollen and congested, and a similar condition may affect the vagina, uterus and Fallopian tubes. The uterus and cervix are soft, and the latter is slightly dilated. In such cases the peritoneum of the pelvis may show congested vessels.

Subsequent to menstruation one or other ovary may contain a **corpus luteum**, or there may be none. This absence of ovulation at the period of menstruation is a matter of some importance, as will be explained presently, and is a fact well authenticated by all operators who have examined the pelvic organs during and after menstruation.

The menstrual discharge comes from the uterus. There is little evidence in favour of the supposition that the Fallopian tubes contribute anything beyond the fluid that is at all times secreted by the epithelium in their interior. It will be necessary, therefore, to describe shortly the microscopical changes that take place in the uterus. Since these are now definitely known and understood, no detailed discussion of previous views and theories is necessary.

The first changes to be seen in the uterus occur in the **premenstrual stage.** All the blood vessels become dilated and engorged (fig. 64); the glands become very much swollen, so that the lumen may be practically obliterated; next the gland epithelium discharges or sets free the secretion (fig. 65), which is rich in mucin and compounds of calcium and other salts. Following this there is a diapedesis of leucocytes and exudation of serum from the capillaries, with a large increase in the size of the stroma cells (fig. 66). The leucocytes migrate into the glands (figs. 67 and 68), and escape by this way, or by forcing their way through the endometrial lining into the cavity of the uterus. At one time it was thought that there was extensive denudation of the endometrium during menstruation. This view is now known to be erroneous, and all authorities are agreed that normally only small pieces of the epithelial surface are broken off when the blood escapes from the *lacunae* by bursting through the endometrium.

The next stage is that of **bleeding**. This is caused by rupture of the capillaries and escape of the contents. The blood which has so escaped makes its way to the surface, and underneath the epithelium *lacunae* are formed by the blood which has collected. This sub-

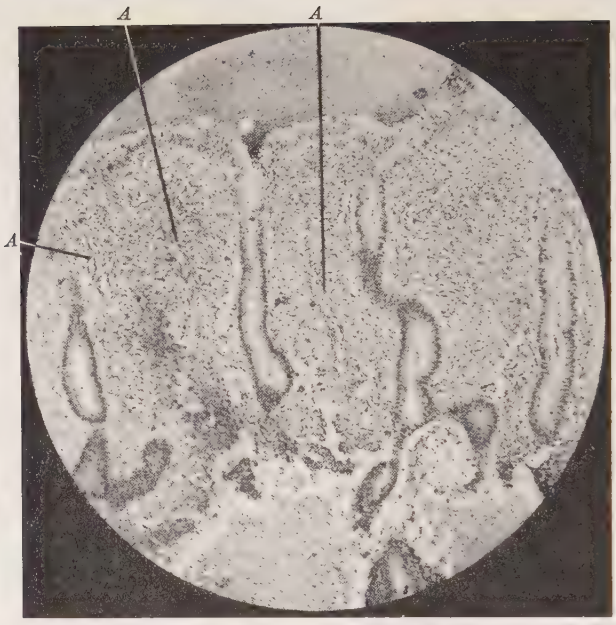

Fig. 64.—Appearance of the dilated vertical capillaries (*A*) and glands of the endometrium in the premenstrual stage. ×50. (*Photomicrograph. J. Macgregor, 'Study of the Endometrium.'*)

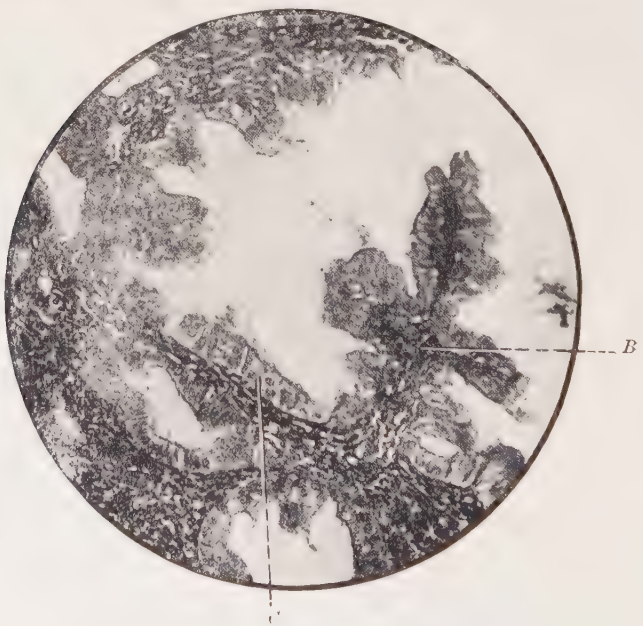

Fig. 65.—Section of the endometrium during menstruation, showing the glandular activity. The columnar epithelium (*C*) lining the glands is actively secreting. *B.* is a glandular ingrowth. The stroma is full of swollen cells and leucocytes. ×420. (*Photomicrograph.*)

sequently escapes into the cavity of the uterus by rupture of the continuity of the epithelium (figs. 69, 70 and 71).

The third stage is that of **recuperation**, when mitotic figures are to be observed in the gland epithelium, in the epithelial cells lining the uterine cavity, and in the stroma cells to a less extent.

Finally there is the **resting stage**, during which the endometrium has the ordinary characteristics which have already been fully described.

General conditions associated with menstruation.—In animals the 'heat' or 'rut' is probably unassociated with any general symptoms or discomfort beyond the stimulation of the sexual appetite, but

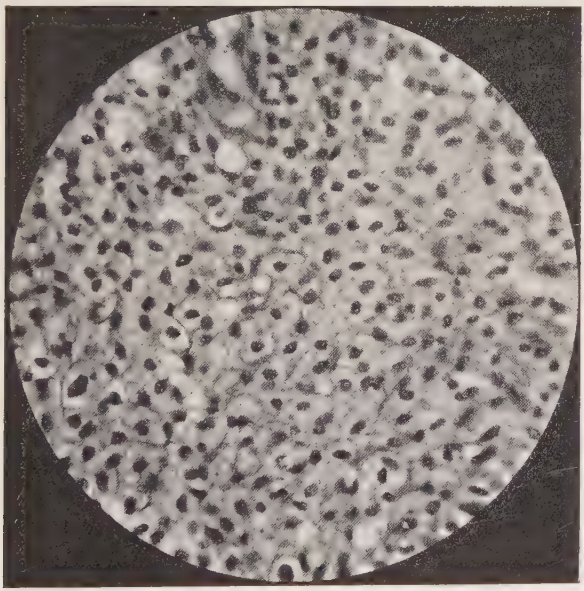

Fig. 66.—The stroma of the endometrium during the premenstrual stage. Note the compact and swollen condition of the cells (almost decidual in appearance). ×300. (*Photomicrograph. J. Macgregor, 'Study of the Endometrium.'*)

women usually suffer to some slighter or greater extent during the catamenia. Very few women have no discomfort.

Many are more nervous and excitable before the onset of menstruation; the pulse rate, blood pressure and temperature all rise with the onset. There is frequently pain of a vague character in the back or abdomen, and this may be due either to the increased vascularity of the parts, when such is marked, or in some instances to pathological conditions to be described later.

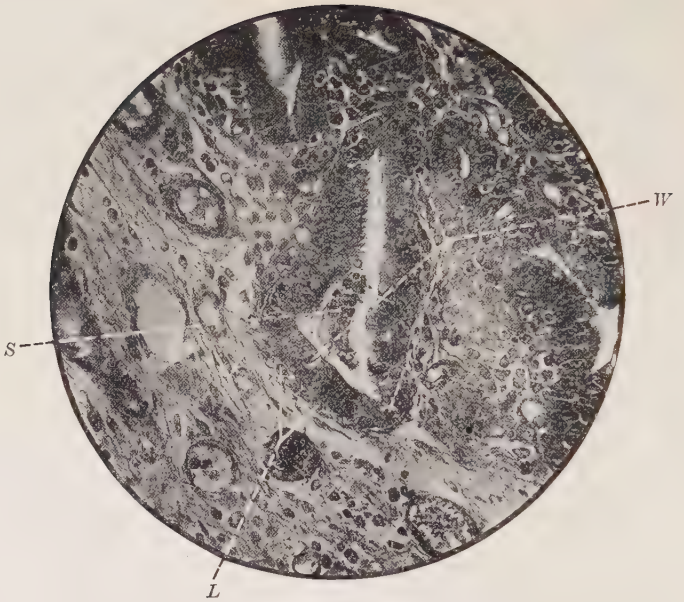

Fig. 67.—Endometrium from the rabbit during menstruation. The section shows a gland containing secretion in which leucocytes are imbedded (*S*). *L*. Leucocytes collecting outside the gland preparatory to migrating through the wall. This migration may be seen in various places in different stages of progression (*W*). ×420. (*Photomicrograph.*)

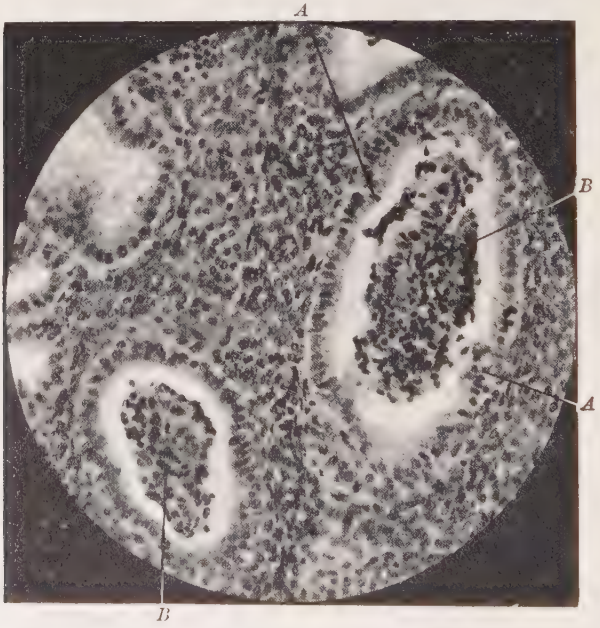

Fig. 68.—Leucocytes passing into the lumen of the glands during menstruation. (The fact of it being a menstrual phenomenon is not stated by Macgregor.) Note the swollen and compact condition of the stroma cells. ×200. (*Photomicrograph. J. Macgregor, 'Study of the Endometrium.'*)

A. Leucocytes passing through wall of gland. *B*. Plug of leucocytes in gland lumen.

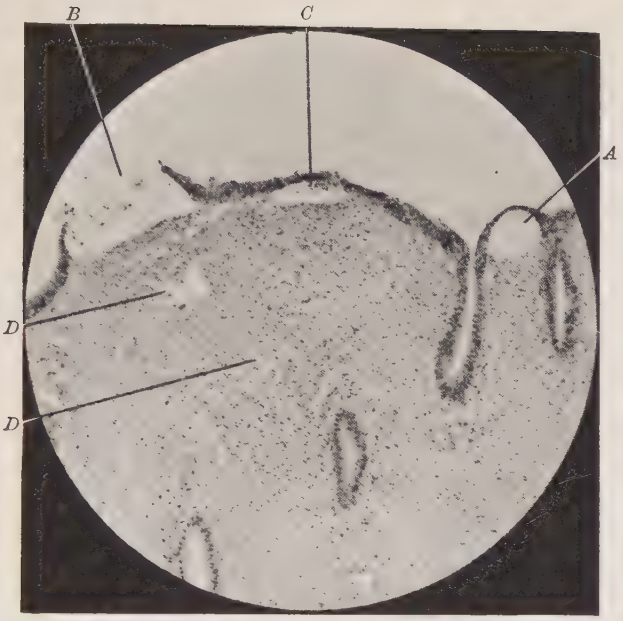

Fig. 69.—Formation of subepithelial haematomata (lacunae) during menstruation. ×75. (*Photomicrograph. J. Macgregor, 'Study of the Endometrium.'*)

A. Unruptured haematoma. *B.* Ruptured haematoma. *C.* Leucocytes breaking through the epithelium covering lacuna. *D.* Dilated vessels.

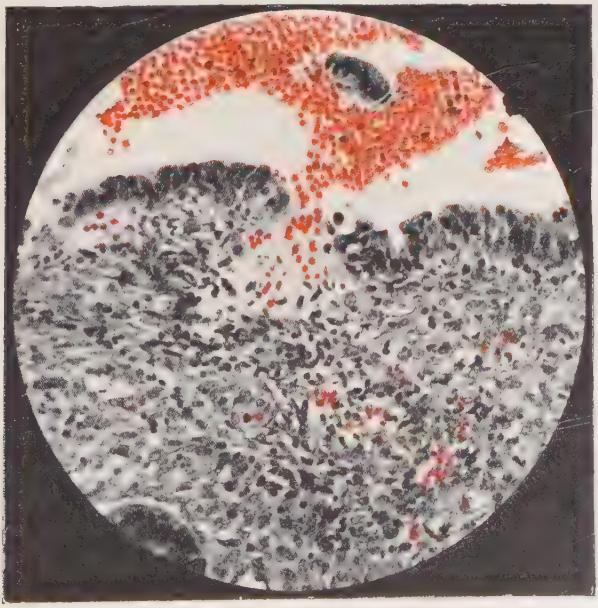

Fig. 70.—Removal of portion of superficial endometrium by menstrual haemorrhage. Note also the leucocytes near the lacuna and in the discharged blood. ×200. (*Photomicrograph. J. Macgregor, 'Study of the Endometrium.'*)

With the onset of the discharge there is usually remission of all the above conditions. After the flow there is a period of 'slackness' sometimes amounting to depression, and headache is not uncommon. There seems no doubt, too, that the bacterial resistance of the subject is reduced by menstruation. This is shown by the variation in the opsonic index.

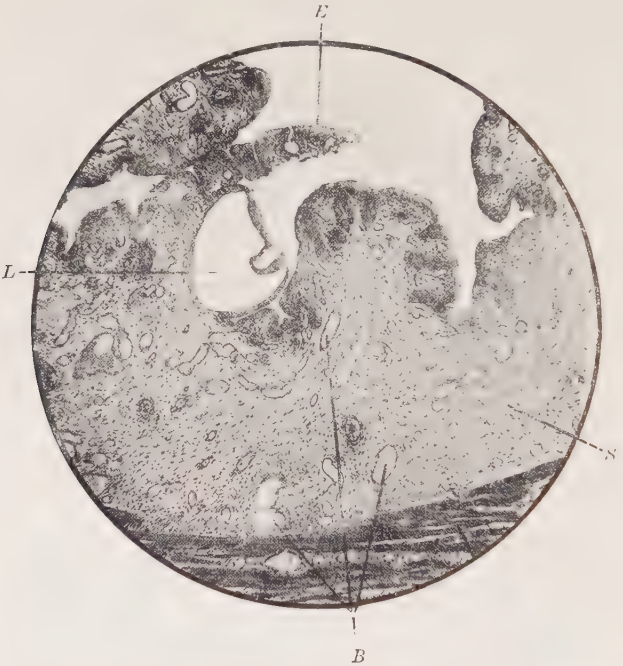

Fig. 71.—Endometrium (from the rabbit) during menstruation, showing the formation of a lacuna (*L*) which has detached a piece of the superficial endometrium with its covering of columnar epithelium (*E*). *S.* Oedematous stroma. *B.* Dilated blood vessels. ×75. (*Photomicrograph.*)

The physiological importance of menstruation.—The various theories held as to the causative factors in regard to the function of menstruation have all been founded upon a utilitarian basis. Menstruation has, in fact, been chiefly looked upon as a local process associated ultimately and solely with conception, instead of being considered the local manifestation of a general disturbance of the metabolism. Owing to the lingering deaths many of these 'local' theories are dying it is necessary to say a few words in regard to some of the best known of them.

The **ovulation theory** has held its ground well. This theory maintains that menstruation is the direct result of the ripening and rupture of a Graafian follicle. It has, however, been shown that rupture of

the Graafian follicle *follows* the proœstrum stage (*i.e.* menstruation) in animals. Further, all operators know that in the human subject menstruation frequently occurs without any signs of a ripe or ruptured Graafian follicle in either ovary, and further that follicles frequently ripen and rupture in the absence of menstruation. This theory, therefore, may be considered to be entirely discredited.

The '**freshening' theory,** which holds that menstruation is a process of freshening, or preparation, of the uterine cavity for pregnancy, similarly cannot be accepted now that it is known that no extensive denudation occurs, and also that pregnancy frequently takes place in the absence of menstruation. In illustration of the latter fact two instances may be quoted. One patient stated that although previously regular she never menstruated once during the first twenty-three years of married life, during which time she had eleven children. Another woman said that she never menstruated *at all* until the age of forty-four, by which time she had been married twenty-six years, and had had four children and five miscarriages.

The theory in regard to the **monthly abortion** of an unfertilized ovum is similarly untenable in view of the known fact that menstruation occurs in the absence of a ripe ovum.

Everything—every known fact and all the recent experimental work—leads us to the conclusion that we must seek for some general metabolic change to account for menstruation. As already stated, evidence has been put forward in support of the view that the calcium metabolism is largely concerned in this function, which does not commence until the child has grown to puberty and has laid down her bony framework, and only recurs when there are no other claims on the calcium economy of the subject. Whether these views be correct or not, they are probably not the whole truth, for it is extremely probable that the ductless glands, one and all, play an important part in the genital functions, and in controlling the calcium metabolism itself. There is direct evidence that this is so in the case of the pituitary body, the thyroid and ovarian glands; and strong presumptive evidence in regard to the adrenals, for the extract of these has recently been shown to influence favourably osteomalacia, a disease which was formerly treated by oöphorectomy.

§ iii. THE PHYSIOLOGY OF CONCEPTION AND REPRODUCTION.

In discussing menstruation we have seen that while this process indicates an active and normal condition of the female genital organs,

it is in no way necessarily an adjunct to nor concomitant with fertility and reproduction. We know that in certain circumstances women who menstruate normally may conceive in the absence of menstruation, and it is now well proven that conception has occurred in children before the onset of this function, and in women several years after the menopause. We have no need, therefore, to consider menstruation further in regard to the physiology of conception.

The maturation and rupture of the Graafian follicle, together with the extrusion of the ovum, are the first points that must attract our notice. We have already seen in the last chapter how the Graafian follicle is formed. It is probable that normal Graafian follicles do not remain *in statu quo* for any length of time. Either they become ripe and burst, or they degenerate. The process of ripening is very simple. In the original stage the Graafian follicle consists of the central ovum encircled by the cells of the **membrana granulosa** (see fig. 37, p. 38). Gradually fluid is secreted by these cells, and this fluid distends the follicle until the cells of the membrana granulosa become flattened out, and the ovum remains attached only at one spot by a proliferation of the membrana granulosa cells which produce what is known as the **discus proligerus** (see fig. 38, p. 39). The enlarging follicle gradually increases in size until it reaches the surface, on which it protrudes like a small cyst. At this, or at an earlier stage, retrograde changes may possibly occur, and the cyst disappear. This retrogression is common in animals, but it has not been definitely shown to occur in the human female after puberty, although it is known to occur in childhood.

Ordinarily the Graafian follicle bursts, and the ovum escapes. As already stated, it has been shown that in animals menstruation precedes rupture of the Graafian follicle. What causes this rupture? In some animals, such as the rabbit, copulation is necessary to effect the setting free of the ovum; in woman this contributory cause is unnecessary. What happens is this: there is a sudden haemorrhage into the already distended follicle increasing the tension beyond the strain-limit of the capsule, which consequently gives way. Sometimes a considerable amount of blood escapes into the peritoneal cavity, and this may give rise to sudden and violent pain. Cases have even been recorded in which a definite haematocele (collection of blood in the pelvis) was formed. In other cases rupture does not occur in spite of the haemorrhage; in these circumstances a blood cyst is formed in the ovary. The actual cause of the haemorrhage has never been proved. It is possible that the lowered calcium content of the blood found at the commencement of menstruation, giving rise to vasodilatation, may lead to the subsequent rupture of the capillaries lining the wall of the ripe Graafian follicle, if there be one. Rupture of a ripe follicle in

the absence of menstruation must be due to its own internal tension plus mechanical factors—such as coitus; or even to an alteration in the calcium content of the blood brought about by causes other than menstruation.

When the follicle is thus laid open the ovum is carried out in the rush of fluid, and is usually caught in the neighbouring fimbriae of the Fallopian tube and carried into the Fallopian ostium. If this course be not followed the ovum may find its way into the ostium of the tube of the opposite side. In order to reach the latter the ovum must be carried across the pelvis. This is probably brought about by the peritoneal currents that are known to exist.

Impregnation of the ovum.—This usually occurs within the lumen of the Fallopian tube. It is held by some authorities, and there seems to be much reason in their contentions, that fertilization of the ovum before it reaches the Fallopian tube is responsible for many of the cases of ectopic gestation.

Implantation of the ovum.—The ovum, by that time fertilized, is said to reach the uterus about seven days after it has escaped from the Graafian follicle. During the descent from the upper part of the Fallopian tube to the uterus the ovum, nourished by the secretion from the mucous membrane over which it passes, is undergoing segmentation, and it reaches the uterus in the condition known as a 'blastocyst.' Recent research has shown that many of the older views concerning the implantation of the ovum are incorrect, so that it is necessary here to consider briefly some of the essential factors in this process as at present accepted, since they have a direct relationship to the pathological processes concerned in ectopic gestation (see p. 228), and to the malignant disease known as chorionepithelioma (see p. 378).

It used to be thought that the ovum was caught in some furrow in the endometrium, and by its presence induced a decidual reaction: this was supposed to lead to a local tumefaction, as a result of which the ovum became enclosed by the 'decidua reflexa' which grew around and over it. This view is now known to be incorrect. The outer cells of the blastocyst are known as the **trophoblast**, and these cells by virtue of enzymes they contain digest the cells of the endometrium with which they lie in contact. In this way the ovum becomes imbedded by a process of eating its way into the uterine mucosa. At the same time a decidual reaction or change is produced in the cells of the endometrium, and the capillaries of the maternal tissues are opened up to provide nourishment for the young ovum and eventually bring about the vascular relationship in the placenta that exists between the mother and her foetus. Now it is this very power of erosion possessed

by the trophoblast that leads to thinning of the wall of the Fallopian tube, and thus favours rupture and haemorrhage in ectopic pregnancy.

While the ovum is imbedding itself in the endometrium, the trophoblast undergoes changes in form and growth which are recognized histologically by the early appearance of an internal layer known as the cyto-trophoblast, and an external layer known as the plasmodi-trophoblast (fig. 72). The plasmodi-trophoblast consists essentially of what is known as **syncytial tissue.** That is to say it consists of masses of protoplasm, in which nuclei are imbedded, but in which there are no defined cell limits; hence the name 'syncytium,' which implies a fusion of cells. This plasmodium or syncytium throws out processes towards the maternal tissues at first exercising only a destructive

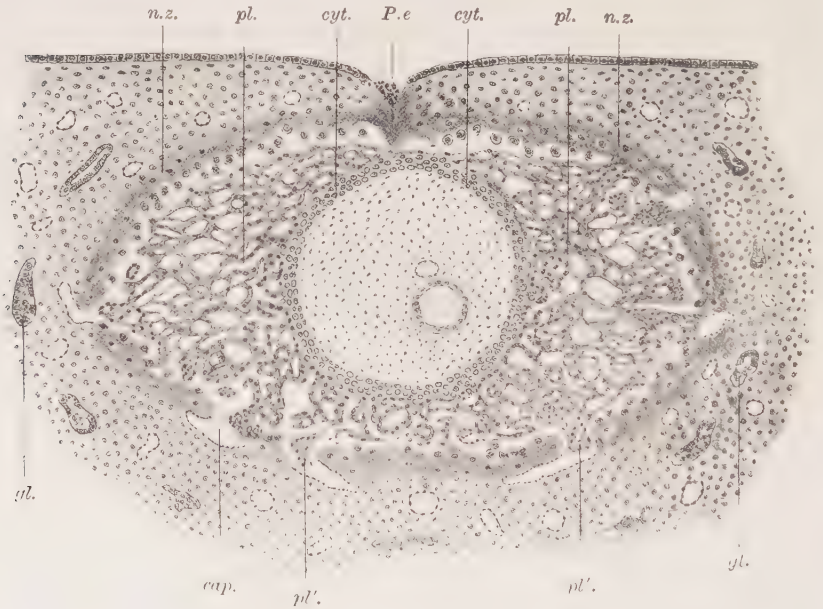

Fig. 72.—Diagram representing implantation of human ovum. (*Bryce and Teacher, 'Early Development and Imbedding of the Human Ovum.'*)

P.e. Point of entrance. *cyt.* Cyto-trophoblast. *pl.* Plasmodi-trophoblast. *n.z.* Necrotic zone of decidua. *gl.* Gland. *cap.* Capillary. *pl'.* Masses of vacuolating plasmodium invading capillaries. The cavity of the blastocyst is completely filled by mesoblast, and imbedded therein are the amnio-embryonic and entodermic vesicles. The natural proportions are strictly observed.

action, enlarging the implantation cavity, and opening up maternal capillaries which supply a pabulum for the early ovum. Normally the action of the plasmodium eventually becomes restricted, and an attachment is formed with the maternal tissues. These attachments develop into the chorionic villi, by means of the outgrowth of the

cyto-trophoblast between the plasmodial masses. The plasmodium gradually tends to disappear, eventually forming a cap, as it were, to the cyto-trophoblastic processes, the outer cells of which are known as **Langhans' layer** (fig. 73). Now this physiological knowledge has recently thrown considerable light upon the pathology of the malignant disease known as chorionepithelioma, which in the vast majority of cases is a sequel to impregnation. As will be described later, it is the unrestrained action of the trophoblastic elements that produces that disease, which is especially liable to follow the form of chorionic degeneration known as 'vesicular mole' (see p. 236).

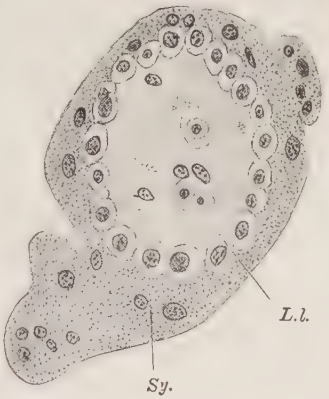

Fig. 73.—Section of a chorionic villus from an early ovum. (*T. H. Bryce, from Quain's 'Anatomy.'*)

Sy. Syncytium. *L.l.* Langhans' layer.

It is unnecessary here to trace the local processes in regard to normal conception further, for we have gleaned from the early stages those points which it is necessary we should fully understand in order that we may follow later the pathological conditions dependent upon abnormal processes in respect to conception.

The general disturbances and local changes which occur during pregnancy are, however, of great practical importance, for they are called into question in the diagnosis of many pelvic conditions, and, therefore, although strictly speaking belonging to the province of obstetrics must be considered here.

Before going into the details of diagnostic importance in connexion with pregnancy it may be well to make a few general statements.

The usual period of gestation lasts for 10 lunar months, that is 40 weeks or 280 days, but, exceptionally, the time may be extended for as much as 4 weeks longer. Normally menstruation is entirely absent (amenorrhoea) throughout this period. There is some relationship between the duration of pregnancy and the height of the fundus uteri above the symphysis pubis, where it can be distinctly felt after the first fourteen weeks of gestation. The average position of the fundus at the different periods is indicated in figure 74. The size of the uterus depends, within certain limits, on the size of the child and amount of liquor amnii: but the estimation of it may be of value in making a diagnosis, especially if one can correlate the period of amenorrhoea and the size of the enlarged organ.

The symptoms and physical signs of pregnancy are best described according to the period of gestation. Pregnancy cannot be detected

for certain in the majority of cases before the seventh or eighth week.

At the end of the eighth week.—General disturbances.—There is almost invariably *amenorrhoea*; that is to say, the patient does not menstruate after impregnation and implantation of the ovum have occurred. *Morning sickness* is of very constant occurrence, especially in primigravidae. It usually commences in the sixth week. In some cases the vomiting occurs throughout the day, especially after food. *Giddiness* and *faintness* are also frequently complained of.

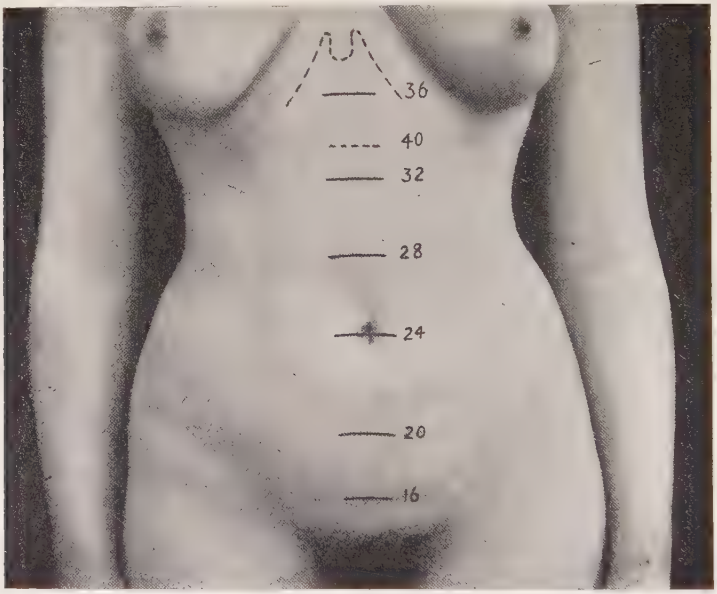

Fig. 74.—The average position of the fundus uteri at different periods of pregnancy. The numbers, which indicate weeks, are those adopted by Whitridge Williams in his *Textbook of Midwifery*.

Local changes and phenomena.—*Frequency of micturition*, from the presence of the enlarging anteverted uterus generally begins to manifest itself about the eighth week. It is only observed while the uterus remains in the pelvis; as the organ rises into the abdomen this symptom disappears.

Colouration of the vagina and cervix.—On inspection the vaginal mucous membrane and the cervix of the uterus present a violet colouration. This is usually more marked in primigravidae than in multiparae. The colouration is due to venous congestion of the parts, and tends to increase in intensity during the succeeding months.

Increased size and vascularity of the uterus.—On bimanual palpation the body of the uterus is found to be enlarged, anteverted and globular

in shape. Owing to its weight the uterus is rather lower in the pelvis than normal.

The *softened cervix* and the *pulsation of the uterine and vaginal arteries* can also be felt.

From the ninth to the end of the eighteenth week.—The general disturbances and phenomena continue during the third month, but usually decrease during the fourth, except the amenorrhoea, which, of course, persists.

By this time the *mammae are active*, and furnish important signs of diagnostic value. As early as the ninth week, but usually a little later, the breasts are found to be enlarged, and the peripheral lobules may be distinctly felt as hard rounded nodules. About the tenth week, or a little later, enlarged veins may be detected radiating from the nipple, while the nipple itself and its areola become prominent and pigmented. This pigmentation becomes more marked as pregnancy advances, and depends for its depth of hue upon the natural colouring of the subject. Quite early, too, especially in dark women, a secondary areola forms outside the primary areola. When this is well developed the dark background presents a rain-spotted appearance owing to the uneven distribution of the pigmentation. The formation of 'Montgomery's tubercles,' due to the dilatation of sebaceous glands on the primary areola is also noticeable at this time. Secretion first appears in the breast about the sixteenth week. In multiparae it appears earlier than in primigravidae. At first it is clear and opalescent, later the secretion becomes milky in appearance.

Local changes and phenomena.—On examination of the abdomen the uterus can be felt rising out of the pelvis after the fourteenth week, and sometimes there is much pigmentation of the median line between the umbilicus and the symphysis pubis (*linea nigra*). On bimanual examination (see p. 109) the uterus feels large and globular, and the cervix very soft.

About the tenth week *Hegar's sign* is often well defined. This sign is obtained in the following way. The fingers of one hand in the vagina and those of the other hand pressing deeply through the abdominal wall are made almost to meet through the softened lower segment of the uterus. The fingers in the vagina are placed in the posterior cul-de-sac, and thus impinge on the posterior surface of the lower uterine segment, while those of the other hand impinge on the anterior surface of the lower uterine segment through the abdominal wall. Or the fingers in the anterior fornix may be made to meet those pressing through the abdominal wall on the posterior aspect of the lower uterine segment of the anteflexed uterus (fig. 75). This softening of the uterus only occurs in pregnancy.

At the seventeenth or eighteenth week *internal ballottement* can usually be obtained. This sign depends on the presence of a hard substance (the foetal head) floating in a sac full of fluid. The

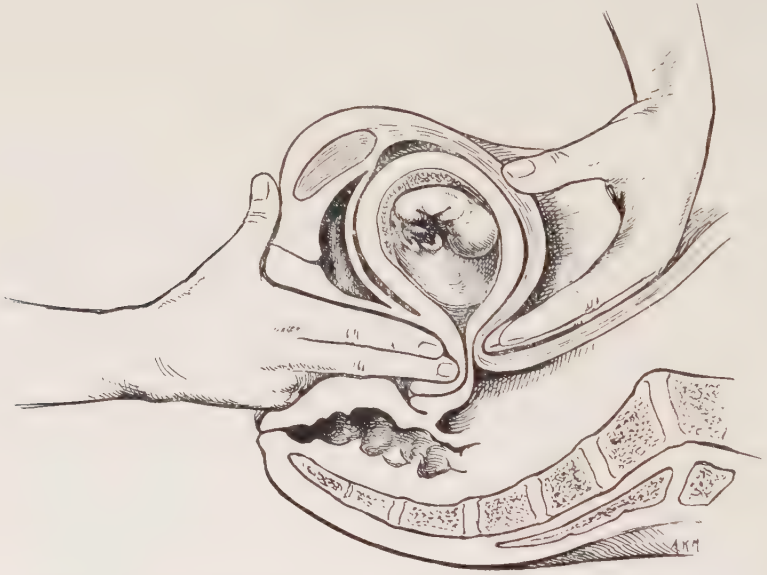

Fig. 75.—Diagrammatic section through the pelvis, showing the method of obtaining Hegar's sign when the uterus is anteverted.

manoeuvres necessary to obtain this sign are carried out bimanually. The uterus is fixed with one hand on the abdominal wall, while the two fingers in the vagina are poked sharply into the anterior cul-de-sac. If the head of the foetus happen, as is frequently the case, to be lying in proximity to the anterior uterine wall the impact of the fingers will displace it, and if the hand be kept in position the return of the head to its former situation may be felt like a gentle tap against the finger tips.

Intermittent contractions of the uterine muscle can also be detected through the abdominal wall at the end of this period—eighteenth week—and these are strongly indicative of pregnancy.

Last half of pregnancy.—General disturbances and phenomena.—During the last half of pregnancy morning sickness is usually absent. The breasts continue to enlarge, and if they reach a great size *lineae striatae* may be formed from the stretching and rupture of subcuticular structures. The pigmentation is more marked, and the secretion can be freely expressed.

Local changes and phenomena.—The abdomen, too, steadily enlarges until *lineae striatae* appear under the skin of the abdominal wall. The striae usually radiate from the groins upwards and outwards, and are

sometimes seen over the outer parts of the iliac crests and buttocks. These lines never disappear entirely and are therefore a valuable indication of previous pregnancy.

About the twentieth week '*quickening*' occurs: that is to say, the mother becomes conscious of foetal movements, which can also be felt through the abdominal wall by placing the hand on the abdomen over the uterus, and pressing gently. A week or two later *external ballottement* can also be obtained through the abdominal wall, and the most prominent parts of the body of the foetus can be made out by careful palpation. On auscultation the *uterine souffle* can be heard from about the eighteenth to twentieth week onwards. This consists of a soft systolic murmur synchronous with the maternal pulse. It is due to the circulation of the blood through the greatly enlarged uterine and placental vessels. The *foetal heart* can generally be heard after the twentieth to twenty-second week. The position at which this can best be detected is somewhat variable, and the whole anterior surface of the uterus may have to be explored. The point of maximum intensity is usually an inch or two to the left of the mid-line, below the umbilicus. When found, a rapid, regular and unvarying 'tick-tick-tick-tick,' like the sound of a watch, can be heard. The frequency is from 125 to 150 beats a minute. The occurrence of definite foetal heart sounds is positive evidence of pregnancy.

In considering the period of gestation by any of the above signs, it must be remembered that the time of their appearance varies considerably in different individuals, and that the dates given form only a general average.

§ iv. LACTATION.

The external changes that occur in the breast during pregnancy have been described already. A few words are necessary here in order to explain the physiology of lactation.

Evidence has recently been adduced to show that the presence of the foetus is the chief stimulating factor in regard to this function. The extract made from foetal animals has been found to stimulate mammary activity. But even accepting the results of these experiments, there is a large mass of clinical and other evidence which goes to show that the presence of a foetus in the uterus is not at all necessary for the production of the secretion. Women who have never had children have suckled: so too have men with abnormally developed breasts. Animals that have been on heat, and have not become pregnant, may have milk in their mammae at the time parturition would have fallen due had impregnation occurred. So, also, in

cases of pseudocyesis (see p. 97) and of uterine tumour, we sometimes see a milky secretion in the breasts. Generally, of course, the mammary secretion in these abnormal circumstances is not true milk; at the same time there can be little doubt that milk may be secreted independently of pregnancy.

Apparently, then, there are many factors of metabolic origin apart from pregnancy which may lead to the production of a secretion in the mammae. And these are not only of internal origin, for external irritation of the breasts—massage and rubbing—may lead to mammary activity. It is well for the practitioner to bear these points in mind, in order that he may not be misled into the wrong diagnosis of a pregnancy which does not exist, owing to presence of a mammary secretion.

§ v. UTERINE CONTRACTIONS.

The consideration of uterine contractions has been delayed until now in order that the question might be discussed in relation both to the menstrual function and to pregnancy and parturition.

Very indefinite ideas concerning uterine contractions have existed in the past, and no very full description of the important special properties of uterine muscle in regard to contraction, hypertrophy and retraction have been given, nor will it be attempted here in any degree of completeness, even if that were possible. There are, however, some important points in regard to uterine contractions which require mention in order that the pathology of certain disorders to be discussed later may be intelligible.

Normally during the quiescent (intermenstrual) and non-pregnant periods uterine contractions do not occur. This statement is founded upon physiological research in the lower animals and upon clinical observation. *Uterine contractions occur regularly during normal menstruation.* These are painless, and probably non-expulsive, so long as clots do not collect in the uterus, and so long as there is no pathological condition to interfere with the wave of contraction.

During pregnancy peristaltic contractions take place. That is to say, while contraction is taking place in one part of the uterus, relaxation is occurring in another. Consequently the internal capacity is unaltered and therefore little or no expulsive force is exercised, and the effect is painless.

During labour contractions become general, except in the lower uterine segment and cervix, and are expulsive in character. These contractions are also brought about if pregnancy be interrupted at any period. It may be mentioned in passing that pathological collections in the

uterus, or growths of the uterus, may also give rise to expulsive contractions. We are not here concerned with the hypertrophy of uterine muscle during pregnancy, nor with the phenomenon called 'retraction' which occurs after labour. These properties of uterine muscle concern obstetrics. But the subject of uterine contractions cannot be dismissed without a brief mention of the factors that are probably concerned in effecting them.

It is beyond doubt that the uterine muscle fibres are affected by all those agents which ordinarily influence involuntary muscle fibres. Of the chemical bodies circulating in the blood it was shown long ago by Ringer that the calcium salts play a large part in controlling and regulating cardiac contractions. These salts have a similar effect upon the contracting uterus. But in addition it may be presumed that the secretions of the ductless glands, especially of the adrenal and the pituitary (infundibular portion), play some part in the process; for the extracts of these glands, especially that of the infundibular portion of the pituitary, when administered intramuscularly or intravenously cause the active uterus to contract very powerfully.

We have, then, circulating in the blood bodies of great activity in the causation of uterine contractions; and there is no reason to doubt that a sudden increase in those substances may produce an effect such as is seen in labour. In addition to these the actual secretion from the uterus itself, which may be collected by the formation of an artificial hydrometra in animals, when injected produces violent uterine contractions in an active uterus. It is probable, too, that the uterine muscle during pregnancy and menstruation is in a sensitive condition, and responds not only to the intrinsic stimuli mentioned, but also to the mechanical ones provided by the foetus or clots within the uterus.

§ vi. THE MENOPAUSE (Climacteric).

The age at which the menopause, or 'change of life,' sets in varies very considerably. As a rule a woman menstruates regularly for about thirty years. That is to say, if she commence at fifteen years of age she will probably cease to menstruate at forty-five years. In the case of a multipara, however, the periods of gestation do not count, as it were, and she usually continues to menstruate by so much the longer. This is, of course, just a general statement, for no exact information can be given owing to the influence of health, circumstances and heredity on the individual.

The menopause is a critical period in a woman's life, and therefore

some consideration must be given to the normal changes occurring at that time, in order that the abnormal conditions, to be studied later, may be understood. We have already seen in our review of normal menstruation that the process is brought about by a general disturbance of the metabolism in which the ductless glands play a directive rôle. This derangement of the metabolism leads to certain local changes in the genital organs, and gives rise to the phenomenon of menstruation. Now since the menopause is that period of life when the function of menstruation ceases, we must naturally expect to find further disturbances in the general metabolism produced in the process of readjustment to the altered or altering circumstances. At the same time with the disappearance of the menstrual function definite changes occur locally in the genital organs. Let us consider these separately.

General disturbances.—Very few women pass through the menopause without some general discomforts. The slighter these are the

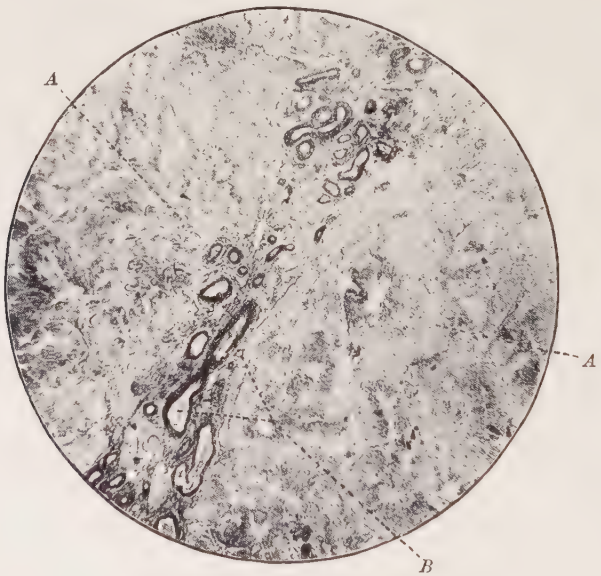

Fig. 76.—Section of senile ovary. ×75. (*Photomicrograph.*)

The ovary is composed almost entirely of the remains of corpora albicantia and fibrous tissue (*A*) divided up by vascular fibrous septa (*B*). The germinal epithelium is absent from the surface, which is covered by the thickened tunica albuginea (not shown in this section).

more normal the process, but since such manifestations are almost universal in women, we are forced to consider them normal to her present stage of evolution and conditions of life.

Nervous system.—As a rule the nervous system becomes very unstable at this period. Under normal conditions nothing serious

happens, but in many cases a pathological state of affairs is reached, as will be discussed later.

Vascular system.—The 'hot flushes' and 'cold shivers,' which seem to be the most common and invariable symptoms of the menopause, are produced by rapid changes in the condition of the vasomotor system.

Fig. 77.—Senile Fallopian tube. The plicae of the mucous membrane (*P*) are seen to have undergone marked fibrosis. ×75. (*Photomicrograph.*)

Vasodilatation is followed by vasoconstriction. These alterations are probably due to the irregular action of the ductless glands.

Disturbances of the abdominal viscera are common. These are in part due to the irregular action of the involuntary muscles in the walls of the alimentary tract.

Subsequent to the menopause, women tend to *become stout* and more lethargic. Sometimes, too, *male characteristics*, such as hair on the face, are to be observed.

There can be no doubt that all these various symptoms are manifestations of some great readjustment of the general metabolism at this period of life; and to physiology we must look for a solution of the problem of the treatment of the excessive disturbances to be met with, which will be dealt with in Chapter VIII.

Local disturbances and changes.—With the onset of the menopause *menstruation becomes irregular.* Sometimes the function ceases very abruptly: when this occurs the general upset is usually considerable. More commonly, however, the final establishment of

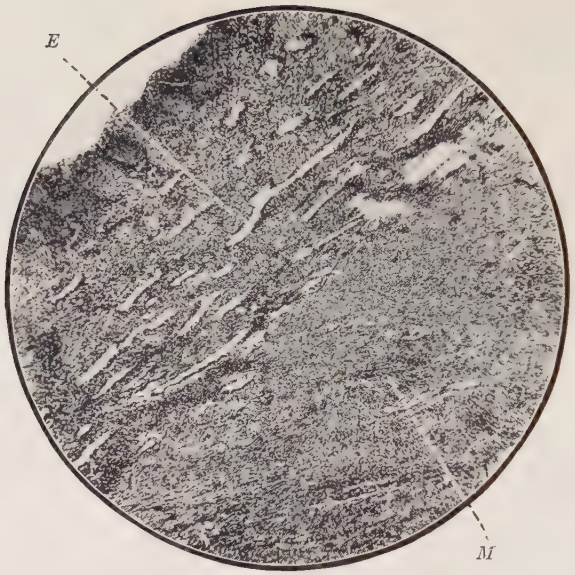

Fig. 78 A.—Low power view of a section through the endometrium and muscle wall of a senile uterus. ×75. (*Photomicrograph.*)

E. Endometrium in which the encroachment of fibrous tissue is leading to obliteration of the glands, which have now quite disappeared on the surface. *M.* Muscle wall which is extremely fibrotic.

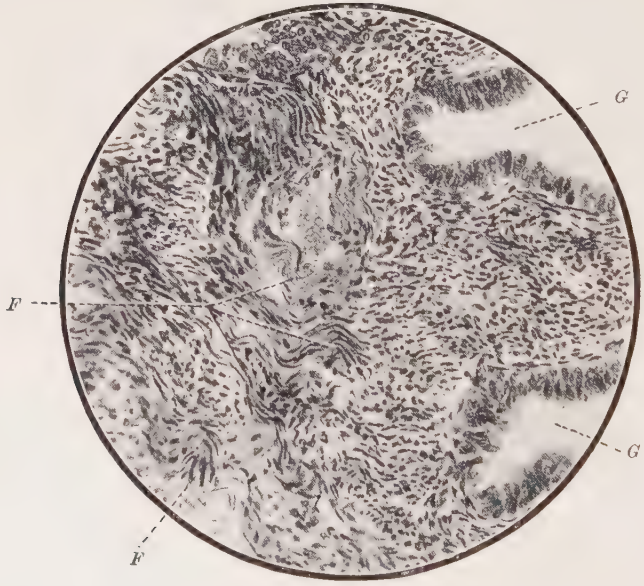

Fig. 78 B.—High power view of a section through the endometrium of a senile uterus. ×420. (*Photomicrograph.*)

G. Glands. *F.* Fibrous tissue which is invading the endometrium.

amenorrhoea is brought about very gradually. At first a 'period' is occasionally missed; perhaps one or two months may pass without the catamenia appearing. Then a 'flooding' may occur, followed perhaps at short intervals by one or two more. Gradually the gap between each menstrual period becomes longer, until the function finally ceases altogether. Usually from the onset to the final conclusion of the menopause a period of one, two, or three years elapses. The menopause, then, may be quite sudden; on the other hand it may extend over many years.

With the cessation of function anatomical changes occur in the genital organs.

The *ovaries* are seen to be shrivelled, and in time may be no larger than a bean. Their surfaces are extensively wrinkled. On section one sees that the stroma has been replaced by fibrous tissue among which may be seen the remains of corpora albicantia; the 'germinal' epithelium has disappeared, and Graafian follicles are not to be found (fig. 76).

The *Fallopian tubes* are shrunken, the mucosa and the muscular coats atrophied and fibrous (fig. 77).

The *uterus* itself undergoes pronounced changes. The first alteration occurs in the muscular tissue, which atrophies and is replaced by fibrous tissue. Later the stroma of the endometrium becomes converted into fibrous tissue and the glands disappear (figs. 78 A and B). The size of the uterus is considerably reduced.

The *vagina* becomes narrowed, shrunken and inelastic. On examination the small cervix can be felt filling the funnel-shaped summit of the passage. The vaginal fornices have disappeared, and the walls of the passage are rigid.

The *vulva*, too, joins in the general deterioration. The labia become atrophied, the fat disappears and the elasticity is lost. The orifice to the vagina gapes. The skin becomes harsh and dry.

Such are the changes that occur at the menopause; and while the general disturbances subside as a metabolic readjustment and equilibrium are brought about, and the patient's normal general condition is gradually restored, the local atrophy and fibrosis which overtake the now functionless genital organs tend only to progress. It should, however, be mentioned that continued sexual intercourse tends to delay the atrophic changes in the vagina.

CHAPTER IV.

CASE-TAKING AND THE EXAMINATION OF THE PATIENT.

§ i. CASE-TAKING.

In gynaecology, as in other branches of medicine, systematic records are of the greatest importance, not only from a collective point of view but also from the point of view of each individual case. If a definite system of investigation be followed and recorded there will be little chance of overlooking some particular which may be of vital importance in assisting us to arrive at a correct diagnosis. It is not always possible, of course, for the busy general practitioner to keep a detailed record of all his cases, but he should at least have clearly fixed in his mind some method and order of interrogation which he intends to follow.

Figures 79 A and B illustrate the two sides of printed cards which may be used for the purpose of recording cases. They have the advantage of simplicity and brevity, while including all the headings of importance.

In questioning a patient one should be careful not to 'rush' her. It is impossible to get accurate information from many women unless they be allowed to take their time, and until they have been placed at their ease.

It is also important for students and young practitioners to remember that what to them is a matter of every-day consideration is almost certain to be a matter of great delicacy to the patient. We must never allow our feelings to become blunted nor our delicacy obliterated if we would not only succeed, but also win the confidence of our women patients, whatever their social standing may be.

In actually recording the case or interrogating the patient it is necessary to draw a sharp line of distinction between her normal

Name : Age : Disease :

Address : Married : years. Single.

Occupation : First Seen :

Previous History : *Menstrual :* Commenced : Cycle : Pain :

Disorders :

Menopause :

Reproductive : Children : last born : Abortions : last :

General :

Present History :

Present Condition : *General :*

Local : per abdomen :

per vaginam :

Fig. 79 A.—Front view of card on which the record of the case is written. (*Reduced.*)

Treatment :

Result :

After History :

Fig. 79 B.—Back view of the same card. (*Reduced.*)

condition previous to the onset of the present illness and the conditions at present obtaining.

Thus the patient's normal menstruation up to the time of her marriage may have been of three days' duration and have recurred every twenty-eight days. Subsequent to marriage this function may have become more profuse and frequent, or less so. From this we conclude that marriage has had some effect upon her menstrual function, and thus we at once narrow down our enquiry by keeping clearly before us the normal condition of the particular patient.

As we have already seen, every woman is more or less a law unto herself in regard to her reproductive functions, and it is often only by clearly understanding her normal condition that we can trace the time and causes of the onset of the abnormal.

One of the very greatest difficulties that we experience in our work as practitioners is in differentiating between what are at present called 'organic' and 'functional' diseases. It is probable that all 'functional' conditions are really organic in that they are the result of a disordered metabolism; but in the present extremely limited state of our knowledge of many of the chemical processes concerned it is of the greatest importance to distinguish between symptoms due to gross lesions of the genital tract, and those symptoms which are 'functional' or 'metabolic' in origin. A careful investigation of the patient's history and environment—even of the details of her social and conjugal life—is by no means out of place; for once we can gain the confidence of a woman she will often place us in possession of facts which will convince us that no operative procedure can relieve her, and that she cannot be cured unless she be removed from her environment.

There is another general principle of considerable importance which must always be borne in mind when questioning, and subsequently examining, a patient. Many of the ailments of women are 'constitutional'—as we conveniently call them—apart from those that we have just termed 'functional' disorders, and apart from actual local lesions.

Thus a patient may be suffering from some severe debilitating disease such as tuberculosis; she may be convalescent from typhoid fever; she may be suffering from athyroidism or hyperthyroidism, and so on: all of these and many other conditions being responsible at times for altered local conditions. A careful enquiry must therefore always be made beyond the immediate local symptoms. This subject will be more conveniently discussed in detail under the various morbid processes with which we shall have to deal later.

Having, then, got a full and reliable 'history' from our patient, we

must next proceed to make a careful examination of the pelvic organs and other parts of the body in relation therewith.

§ ii. EXAMINATION OF THE PATIENT.

Before proceeding to examine the patient there are two rules we should ever set before ourselves and endeavour to follow.

(1) Never to make a vaginal examination of a young virgin, if it can be avoided; that is to say unless there are definite symptoms pointing to a local lesion. The examination should in these circumstances be carried out under an anaesthetic whenever practicable, both for the sake of the patient and for the advantage of the examiner.

(2) Never to examine any woman except in the presence of a third party—preferably a nurse or other independent person.

Again, no woman should be examined when menstruating normally; it is extremely repugnant to her feelings.

In examining a woman it is very necessary to be thorough. To allow of this the patient should be examined when lying undressed in bed; or, if she be examined in the consulting room on a couch, she should take her corsets off and have all her clothing unfastened in such a way that free access can be obtained to the chest, abdomen, and vulva. If the opportunity occur the practitioner should recommend that the bowels be thoroughly emptied with an aperient the night before and an enema on the morning of the day on which the examination is to take place. In unmarried women it is often advisable, as already stated, to employ a general anaesthetic. This will also be found of great advantage in married women when the vagina is small or atrophied, when the abdomen is hard and rigid owing to nervousness, or when the patient is particularly fat. Indeed in many cases it is often unwise to express an opinion in regard to the condition of the pelvic organs until an examination under an anaesthetic has been made.

The examiner must always be careful to have his hands warm, for the patient will involuntarily contract her abdominal muscles if touched with a cold hand. It is necessary, of course, at all times to be extremely gentle and to avoid hurting a patient. Once a patient is hurt she will never completely relax her abdominal muscles—an essential condition for a thorough examination. The whole of the hand should therefore be placed upon the abdomen and palpation carefully carried out. The habit of 'poking about' with the tips of the fingers is much to be deprecated.

There is one more point of general application: scrupulous cleanliness must be observed, both for the sake of the examiner and the patient. The vulva should be washed, and when there is a foul discharge the vagina swabbed out with 1 in 2000 biniodide of mercury solution before and after examination.

The hands of the examiner must be washed with soap and water and soaked in an antiseptic solution. Whenever there is a foul or suspicious discharge, or ulceration, the examiner's hand ought to be covered with a rubber glove to protect him from infection. Likewise an examination of the rectum should never be made unless a finger-stall or glove be worn. Finally all instruments must be boiled before and after use. Neglect to follow this simple precaution may be the means of conveying gonorrhoeal or other infection from one patient to another. In the present day there should never be any difficulty in carrying out these preliminaries in private practice, especially if the woman be informed that such precautions are necessary for her well-being. In hospital work they should be carried out as a matter of routine.

METHODS OF EXAMINATION.

(1) **Mammary.**
- (*a*) **Inspection.**
- (*b*) **Palpation.**

(2) **Abdominal.**
- (*a*) **Inspection.**
- (*b*) **Palpation.**
- (*c*) **Percussion.**
- (*d*) **Auscultation.**
- (*e*) **Mensuration.**

(3) **Vulval.**
- (*a*) **Inspection.**
- (*b*) **Palpation.**
- (*c*) **Pathological examination of specimens.**

(4) **Vaginal.**
- (*a*) **Inspection.**
- (*b*) **Palpation.**
  1. **Simple.**
  2. **Bimanual,** { **vagino-abdominal.** / **recto-vagino-abdominal.**
- (*c*) **Pathological examination of specimens.**

(5) **Rectal.**
- (*a*) **Inspection.**
- (*b*) **Palpation.**
  1. **Simple.**
  2. **Bimanual,** { **recto-abdominal.** / **recto-vagino-abdominal.**
- (*c*) **Pathological examination of specimens.**

(6) **Vesical and urethral.**
- (*a*) **Inspection.**
- (*b*) **Palpation (vagino-abdominal).**
- (*c*) **Percussion.**
- (*d*) **Pathological examination of specimens.**

(7) **Skiagraphy.**

Mammary examination.—Before carrying out the systematic examination of the abdomen it is advisable, if there be any suspicion of pregnancy, to examine the breasts. Although not absolutely physiognomic of pregnancy, for tumours of the uterus and pseudocyesis[1] occasionally produce similar signs, the changes in the breast, especially after the local conditions have been determined, are of very great and decisive importance in regard to pregnancy. This especially obtains in the later months of gestation and in primigravidae, in whom the changes are most distinctly marked. After the first pregnancy the breasts never return to their pristine, virginal form. The breasts and changes in the breasts which occur during pregnancy vary considerably in different women. These changes have been discussed already in Chapter III.

Abdominal examination.—In an examination of the abdomen it is necessary to know the normal boundaries of the different parts and what organs lie within these boundaries. Figure 80 is a front view of the abdominal wall with the regions marked out on the surface. Figure 81 shows some of the abdominal contents (the intestines having been removed) with the surface lines still shown. As the areas and organs are clearly shown in the illustrations it is unnecessary here to go into further particulars of their relationships.

Abdominal inspection.—On inspecting the abdomen, with the patient on her back, the first thing that strikes one is the general appearance. Any irregularity or prominence is to be noted; but beyond the general rule that the abdominal surface slopes gradually

[1] Pseudocyesis is the condition in which the patient imagines herself to be pregnant when she is not.

away from the summit of an ovarian cyst towards the epigastrium (fig. 82), and falls more abruptly from the summit of a fibromyomatous tumour of the uterus (fig. 83), mere inspection is not of much value in the diagnosis of tumours, for one frequently comes across abdominal tumours which are totally out of the place in which one would expect to find them. When there is much ascites present the abdomen

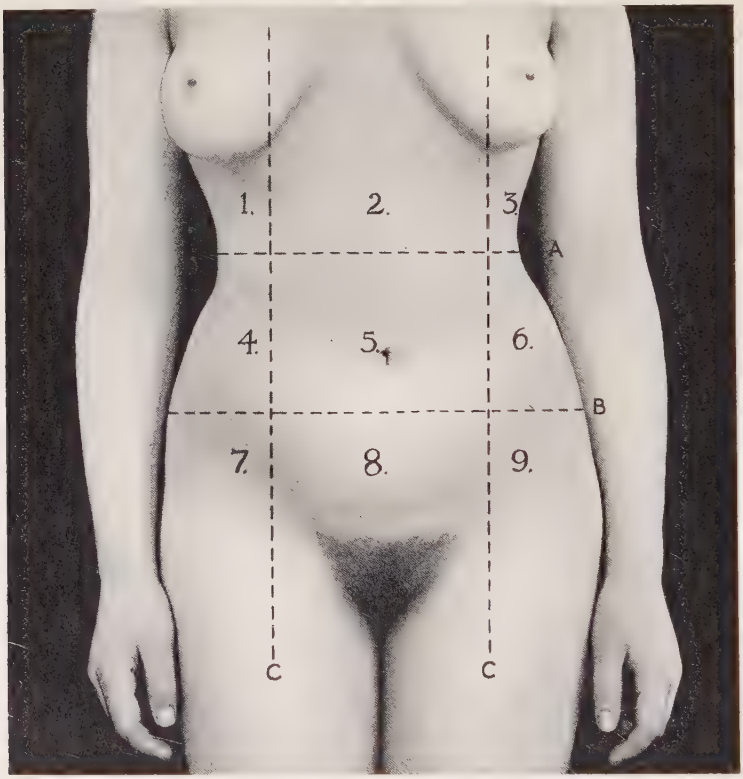

Fig. 80.—Abdominal areas. Surface markings to indicate position of each.

A. Horizontal line at the level of the tenth costal cartilages. *B*. Horizontal line at level of the anterior superior iliac spines. *C*. Vertical line through the middle of Poupart's ligament. 1. Right hypochondriac region. 2. Epigastric. 3. Left hypochondriac. 4. Right lumbar. 5. Umbilical. 6. Left lumbar. 7. Right iliac. 8. Hypogastric. 9. Left iliac.

is 'full' and therefore barrel-shaped, and in these circumstances one often notices that the umbilicus is unfolded and may project in the form of a small hernia if there be any weakness of the part; whereas when the enlargement of the abdomen is due to fat alone the parietes tend to settle pannier-like into the flanks, the upper surface being usually quite flat. A *small quantity* of ascitic fluid, however, produces the same appearance, but there are other distinguishing signs, to be

mentioned directly. If the bladder be distended its outline may frequently be discovered above the symphysis pubis, either alone or lying in front of a pelvic tumour. Inspection also allows us to decide the extent of abdominal rigidity; for if we ask the patient to take a deep breath, we may find that there is only a slight, or no movement of the abdominal muscles; this usually indicates the presence of an acute inflammatory process within the peritoneal cavity. Further peritoneal attachments to underlying tumours may prevent free move-

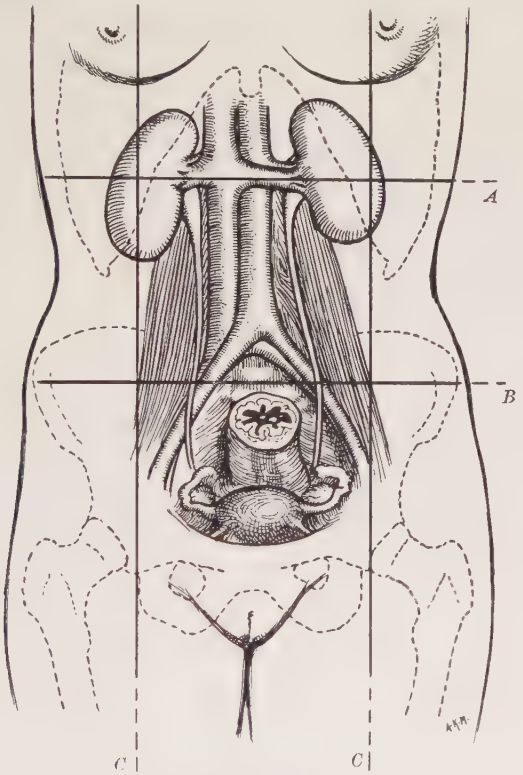

Fig. 81.—Diagram to show the relationship of the pelvic and certain other abdominal contents to the abdominal regions as indicated by the dark lines.

A. Horizontal line at the level of the tenth costal cartilages. *B*. Horizontal line at the level of the anterior superior iliac spine. *C*. Vertical line through the middle of Poupart's ligament.

ment of the abdominal wall over the surface of the growth in question.

Finally, one notes the presence of *lineae striatae*, due to stretching of the skin, usually by pregnancy; pigmentation of the median line between the umbilicus and the symphysis pubis, also due to pregnancy: and enlarged superficial veins indicating hepatic obstruction or, when

the veins are on the lower part of the abdominal wall, pressure on the common iliacs or inferior vena cava.

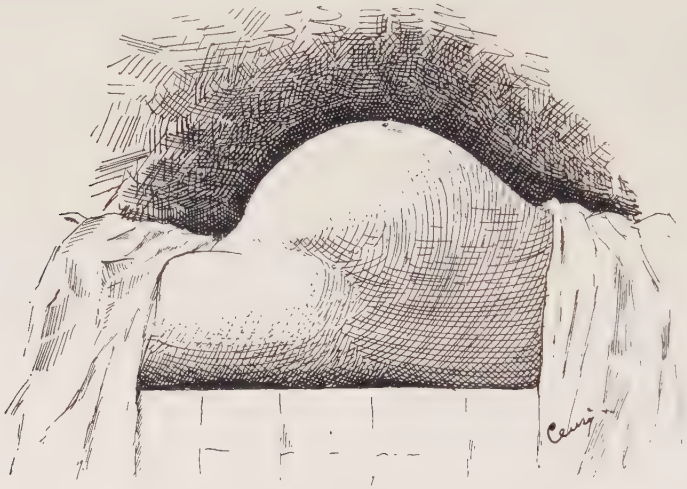

Fig. 82.—The contour of the abdominal parietes with a large ovarian or parovarian tumour.

Fig. 83.—The contour of the abdominal parietes with a large fibromyomatous uterus.

Abdominal palpation.—This must be carried out with care and gentleness. It is necessary to examine the whole abdomen—noting any abnormalities in regard to muscular tension, sensitiveness (hyperaesthesia) or pain; or in respect to the contents of the abdominal cavity.

To make abdominal palpation easy the patient's attention should be diverted, and she should be instructed to lie with the knees drawn up, to open her mouth, and to breathe deeply. It is, also, of great assistance to the surgeon if he superimpose his hands one upon the other in order to relieve the examining fingers of the strain of overcoming the resistance of the abdominal parietes. (See also page 431.)

It is obvious that this method of examination is easiest in multiparae, whose abdominal walls are lax; and that an anaesthetic may be necessary before much can be made out in the case of a nullipara.

In estimating abdominal rigidity one has always to bear in mind the mental attitude of the patient—some are so nervous that the abdominal wall is as hard as a board, while others, although nulliparous, offer not the slightest resistance.

True abdominal rigidity is always associated with some serious intraabdominal affection with marked symptoms, such as continuous pain or grave constitutional disturbance. It is important to locate the area of greatest rigidity, for this always overlies any serious lesion there may be. In fact when there is general abdominal rigidity, and the diagnosis lies, perhaps, between a perforated gastric ulcer, a terminating ectopic pregnancy and an acute appendicitis, an opinion can be arrived at, or at any rate the site for attack decided upon, by noting which area relaxes last as the patient gradually passes under the influence of an anaesthetic.

Areas of hyperaesthesia when present must next be noted. In figures 84, 85, 86, and 87 are shown the superficial skin areas which are in nervous correlation with the pelvic organs. Tenderness, or hyperaesthesia, of these areas is frequently associated with lesions of the correlated pelvic viscera.

Too much importance, however, should not be assigned to tenderness alone as a symptom, for if a woman be at all nervous or hysterical she may be tender everywhere; but as confirmatory evidence tenderness or hyperaesthesia may be of great value.

Abnormalities in regard to the abdominal contents.—Starting in the upper regions one palpates for liver, gall-bladder, stomach or spleen enlargements. Next the kidneys must be sought, for in a certain number of women who suffer from right-sided pain this is due to a mobile kidney. To palpate the kidneys, the examiner with one hand (the left on the right side and *vice versa*) makes counter pressure in the lumbar region, while with the other firmly pressed over the kidney through the anterior abdominal wall he notes if any abnormal mobility can be detected during a deep inspiration on the part of the patient.

Next the right iliac fossa is palpated for any enlargement in the region of the appendix; and then the left iliac fossa, where very

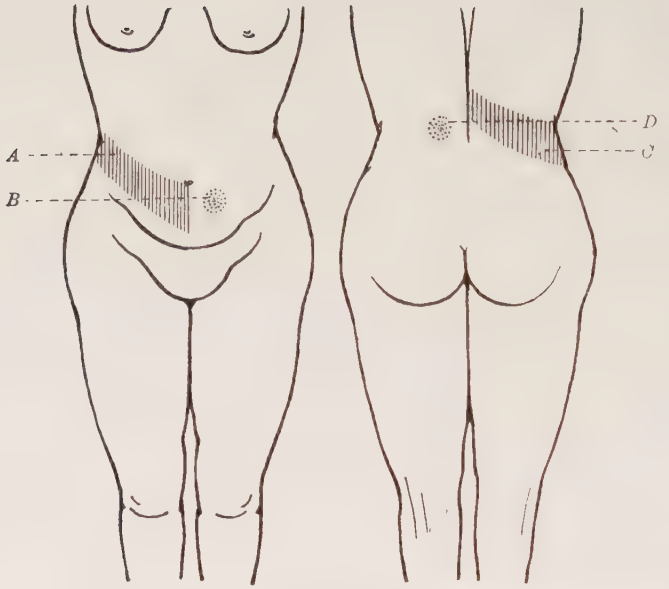

Fig. 84.—Area of cutaneous hyperaesthesia associated with the ovary (10th dorsal nerve). (*After Head.*)

A. Cutaneous area of the 10th dorsal nerve on the right side in front. *C*. The same, behind. *B*. Point of maximum intensity in front shown for clearness on the left side *D*. The same, behind.

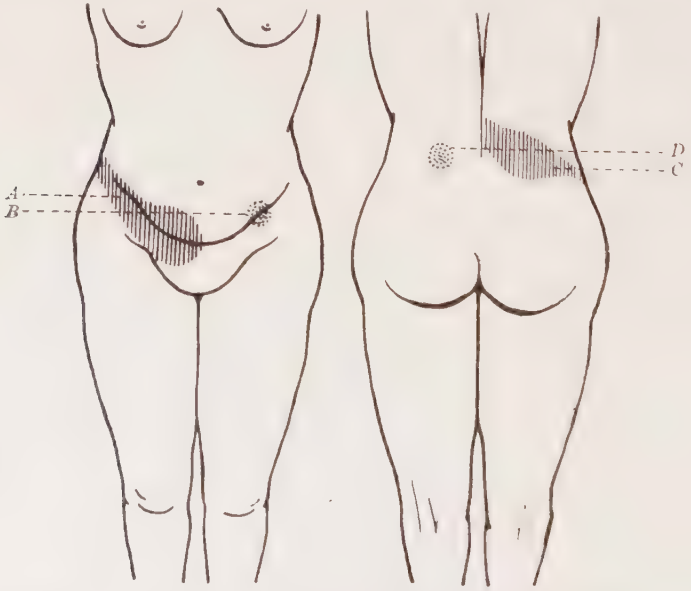

Fig. 85.—Area of cutaneous hyperaesthesia associated with the Fallopian tube (11th dorsal nerve). (*After Head.*)

A. Cutaneous area of the 11th dorsal nerve on the right side in front. *C*. The same, behind. *B*. Point of maximum intensity in front shown for clearness on the left side *D*. The same, behind.

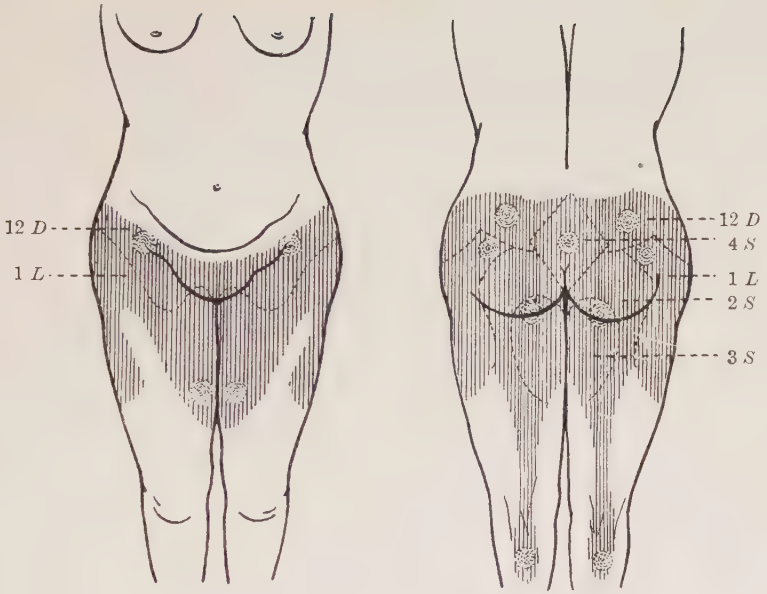

Fig. 86.—Areas of cutaneous hyperaesthesia associated with the cervix uteri. The internal os with the 12th dorsal and 1st lumbar, and the external os with 2nd, 3rd, and 4th sacral. The areas are shaded, and the points of maximum intensity stippled. (*After Head.*)

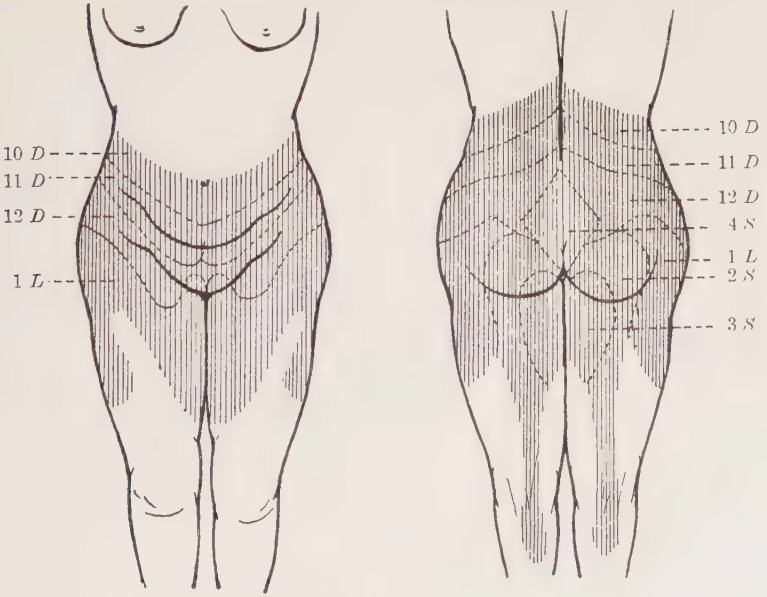

Fig. 87.—Areas of cutaneous hyperaesthesia associated with the uterus (body and cervix). (*After Head.*)

frequently the sigmoid colon can be felt either full of faeces or in a rigid and contracted condition.

The inguinal and femoral regions are next examined for herniae, and finally the groins are carefully palpated for enlarged glands or thrombosed veins.

If there be a definite enlargement, local or general, within the abdominal cavity, skilful palpation will frequently reveal the nature of the enlargement: it may be ascertained that it is due to free fluid; there may be 'dipping'—the sign obtained, when fluid exists between the abdominal wall and a tumour, by suddenly 'dipping' the tips of the fingers on to the tumour and displacing the fluid between it and the abdominal wall (fig. 88); or the enlargement may be due to a fluctuating cyst or abscess; or there may be a solid or semisolid growth, or inflammatory masses, to be felt. In regard to an absolute diagnosis, this can only be made in conjunction with some of the other auxiliary methods of examination, and after a consideration of the history of the case.

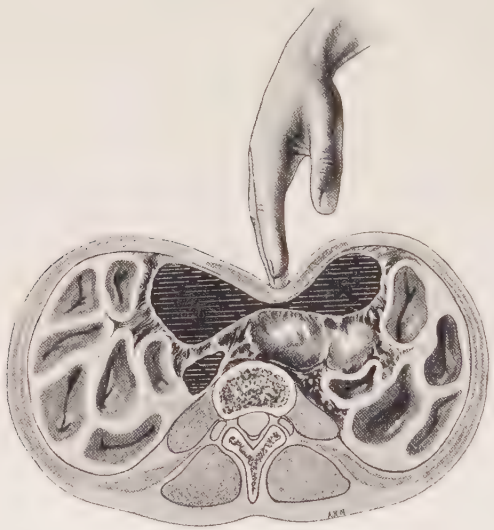

Fig. 88.—Sectional diagram of the abdomen to show how the physical sign of 'dipping' is obtained by the fingers impinging upon a solid growth lying behind a fluid exudate.

Abdominal percussion.—This enables us to decide whether any enlargement of the abdomen produces dulness over the whole, or any particular area. It also enables us to detect free fluid.

Thus dulness over a cystic enlargement resembling the bladder will lead us to test the diagnosis by passing a catheter. Cystic enlargement of the abdomen, with dulness over the front of the abdomen but not in the loins, leads us to suspect a large ovarian cyst (figs. 89 and 90).

Dulness in the flanks with resonance in front raises the suspicion that the abdomen contains free fluid (figs. 91 and 92). If present in any quantity, it can be further demonstrated by a fluid thrill from side to side, and by the disappearance of dulness in the flank when the patient is turned on to the opposite side.

As a rule ovarian cysts quickly reach the surface and are dull over the area which impinges on the abdominal wall (fig. 90); on the other

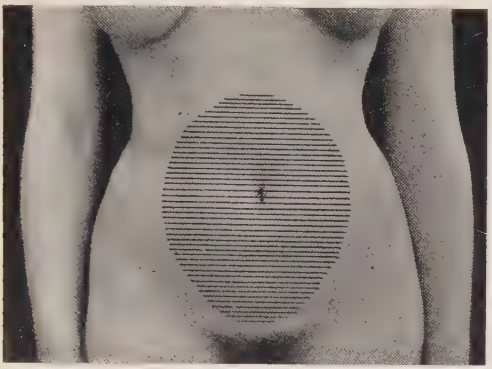

Fig. 89.—The dulness of the anterior abdominal wall with an ovarian cyst is indicated by the shaded lines. The unshaded portion of the abdomen is resonant on percussion.

hand, uterine tumours of moderate size are usually surrounded by bowel, and consequently a resonant note is obtained when the abdomen is percussed over them, especially if the patient be standing up.

A little practice soon enables the student to interpret correctly, in a general way, the condition found on percussion.

Abdominal auscultation.—Auscultation is employed to assist in the diagnosis of pregnancy and to determine whether the foetus be living or not; also to detect friction sounds in the case of a large cyst.

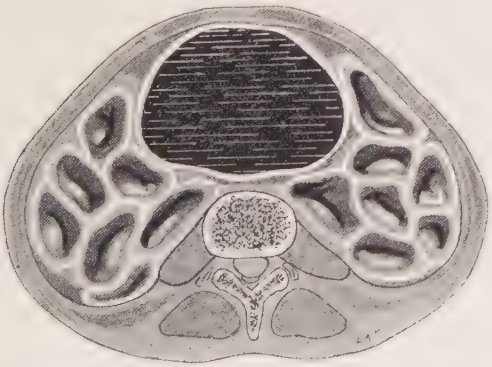

Fig. 90.—Sectional diagram to illustrate the physical signs of dulness in front over an ovarian cyst, and of resonance in the flanks owing to the underlying intestines.

The uterine 'souffle,' which is heard in pregnancy after the eighteenth week over the whole uterine area, is the systolic 'murmur' produced by the blood circulating in the large placental sinuses; it is synchronous with the patient's pulse. A 'souffle' is, however, sometimes heard in cases in which there are large soft myomatous tumours with a free blood supply.

The foetal heart can also be heard after about the twentieth week of pregnancy; and when detected is quite physiognomic of a living foetus.

The friction sounds heard over the abdomen in the case of a large cyst are of a new-leather-creaking character, and are produced by the rubbing of the cyst wall against the parietal peritoneum during respiration. This sign, which is usually due to inflammatory changes in the opposing surfaces, is sometimes of assistance in making a diagnosis

Fig. 91.—The dulness of the sides of the abdomen with free fluid when the patient is lying down, is indicated by the shaded lines. The unshaded area of the anterior abdominal wall is resonant on percussion.

between a large cyst and free ascitic fluid. It is best heard at those points—in the groins and epigastrium—where the curved surface of the cyst recedes from the abdominal wall.

Abdominal mensuration is not employed much in gynaecological diagnosis, although there are a few points of practical importance.

The *bony pelvis*, whose measurements are recorded with the assistance of the pelvimeter, is said to be increased in its normal transverse diameter (intercristal = 11 inches; interspinous = 10 inches) in cases of uterus didelphys and uterus bicornis. It has not yet been satisfactorily proved that this is so. In a case of pregnancy in one horn of a bicornuate uterus, in which Caesarean section was performed owing to the pelvis being flattened antero-posteriorly, careful measurements showed no increase in the transverse dimensions.

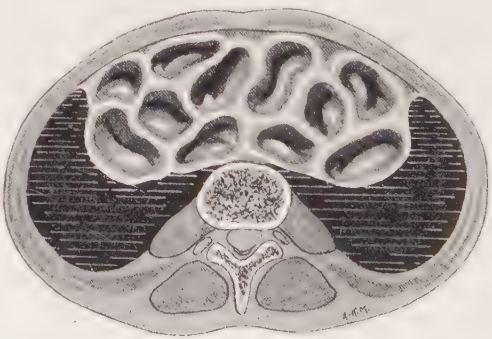

Fig. 92.—Sectional diagram to illustrate the physical signs of dulness in the flanks due to free fluid, and of resonance in front owing to the underlying intestines.

The *anterior abdominal wall* may show deviations from the normal measurements of different areas. Thus with large pelvic tumours the normal relation of the umbilicus to the ensiform cartilage and symphysis pubis may be altered. Normally the umbilicus is opposite the cartilage between the bodies of the third and fourth lumbar vertebrae, and practically half-way between the symphysis pubis and the infrasternal notch. A tumour may, however, so raise the umbilicus, by stretching the abdominal wall below it, that it may be nearer to the infrasternal notch than to the symphysis pubis. Free fluid in the abdomen, with the patient on her back, does not alter the normal relationship. So, too, a pelvic tumour or localized collection of fluid more on one side than the other may increase the distance on that side between the anterior superior spine and the umbilicus.

If a record of these measurements be kept, together with the circumference of the abdomen at the umbilicus, the practitioner may be guided in forming his opinion as to whether a swelling is a slowly growing tumour or a rapid, and perhaps localized, effusion of fluid.

Vulval examination.—In examining the vulva one makes use of **inspection** and **palpation** in the first place, but it may be necessary to rely on a **pathological examination** in making a definite diagnosis of the conditions found.

In regard to what we can observe it is necessary to note the general development of the external genitals and whether they be normal in conformation. It is particularly important, of course, to notice the condition of the hymen and introitus in regard to evidence for and against virginity.

Pathological examinations in regard to diseases of the vulva will consist in the histological examination of pieces of growth removed for diagnostic purposes; in chemical examination of the urine; and in examinations by 'smears,' or otherwise, of vaginal discharges.

Vaginal examination.—This may be carried out with the patient either in the **dorsal** or **left latero-prone (Sims') position** (fig. 93). The latter is the position commonly employed in this country when the patient is not under an anaesthetic, as it is less offensive to her sense of decency than the dorsal (lithotomy) posture.

Vaginal inspection.—In order to make satisfactory examination of the vagina, it is necessary to use a speculum. There are very many varieties of these instruments, but for practical purposes Sims' duckbill speculum (fig. 94), Cusco's bivalve speculum (fig. 95), or the metal Fergusson's speculum (fig. 96) are all that can possibly be required.

These can now be obtained furnished with an electric lamp (fig. 97) which is a valuable addition for private practice.

When inserting a speculum great care should be taken not to hurt the patient. The speculum should be warm and well lubricated,[1] and inserted without impinging upon the sensitive vestibule. This is best accomplished by inserting the beak in an antero-posterior direction and then gradually hooking it round the perineum, keeping the pressure the whole time in the direction of the rectum (fig. 98).

With the speculum in position any violet colouration of the vagina is noted, and any pathological or abnormal condition investigated. At the same time the cervix is brought into view, and if there be a vaginal discharge, bloody or otherwise, it is possible to decide

Fig. 93.—Sims' latero-prone position.

whether this proceeds from the interior of the uterus, from the cervix, or from the vagina. Material—a 'smear' or a portion of growth—may also be obtained for pathological examination.

Hysteroscopy, or direct inspection of the uterus on the principle of cystoscopy, may be employed with advantage in many cases. As this method of examination is quite a recent innovation it is unnecessary to say more here than that it promises to be a very valuable procedure.

[1] The following is an excellent formula for a lubricating material for gynaecological work ; it has the advantage of washing off easily :

Pulv. Tragacanth. 15 gm. Glycerin. 50 gm. Thymol. 0·25 gm.
Ol. Lavandul. 0·25 c.cm. Aq. ad 500 grammes.

Vaginal palpation.—This may be direct, when the finger is used to palpate an obvious lesion, to estimate its consistency and so on; or the examination may be that known as *bimanual palpation.* The

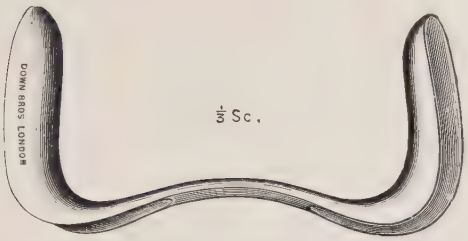

Fig. 94.—Sims' speculum.

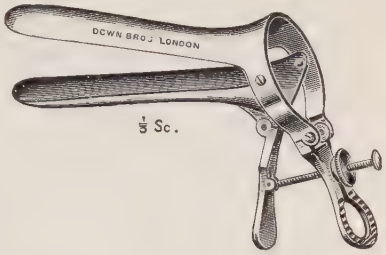

Fig. 95.—Cusco's bivalve speculum.

latter is one of the most important methods of gynaecological examination, and proficiency can only be obtained by long and continued practice; unfortunately, too, it is an art that is soon lost, so that practitioners when they leave the constant routine of hospital work, are apt to lose their skill in bimanual examination unless they be able to obtain frequent practice.

Students, also, are liable to be very despondent as to their ability ever to acquire what is undoubtedly one of the greatest acquisitions a

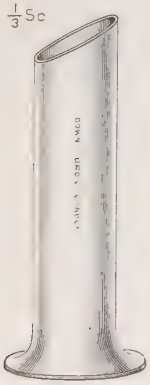

Fig. 96.—Fergusson's speculum.

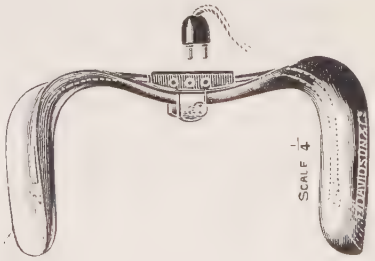

Fig. 97.—Electrically illuminated Sims' speculum.

general practitioner can possess—the skill to examine a woman gently, thoroughly, and to some practical purpose.

There are no conjuring tricks about it. Some with a delicate sense of touch and long fingers will always be more skilful than others; but it is within the power of any one who will take the trouble to learn, to feel that great satisfaction which comes to the gynaecological student when he has for the first time been able to define the uterus and

ovaries as though he had them in his hand. But no student should be despondent because perhaps the next time, after a successful attempt, he "can feel nothing." His teacher may be in the same predicament, for by this method of examination we are very dependent upon our patients' nerves, will, parity and adipose condition. Some women are extremely easy to examine, some very difficult—impossible, perhaps, without an anaesthetic.

To make a bimanual vaginal examination, then, the patient may be in the Sims' position or in the dorsal position. In this country the full dorsal or lithotomy position is rarely used, unless the patient be

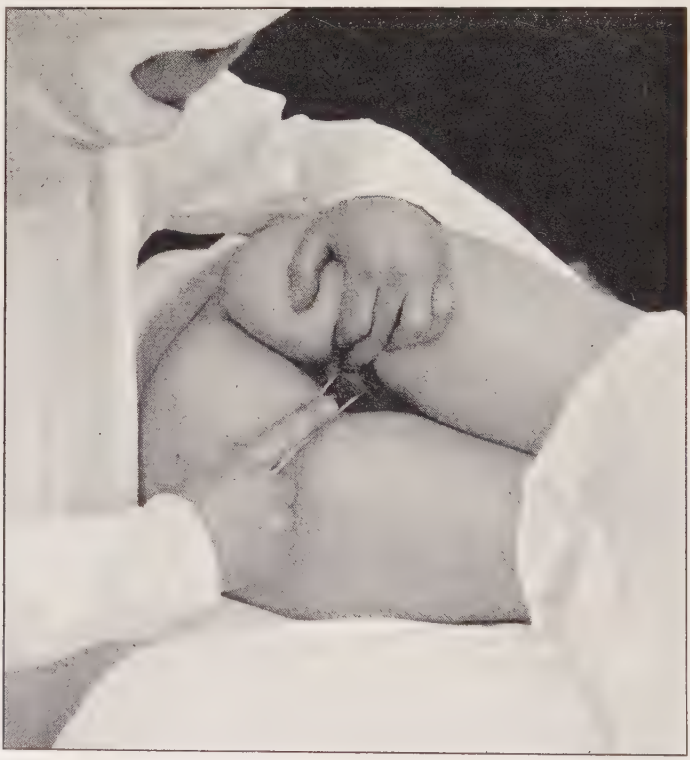

Fig. 98.—Method of inserting Sims' speculum. The patient is in the left latero-prone (Sims') position. The examiner is seen inserting the beak of the speculum before rotating the handle towards the anus to complete the manipulation.

under an anaesthetic. A modified dorsal position in which the patient can be covered is, however, frequently employed and is of great service (fig. 99).

The bimanual examination may be *vagino-abdominal*, when the first, or first and second finger of one hand are inserted into the vagina, and

the other hand is placed on the hypogastrium; or it may be *recto-vagino-abdominal*, when the first finger is in the vagina, and the second in the rectum, the other hand being on the hypogastrium. This last is a method frequently used in the examination of nulliparae.

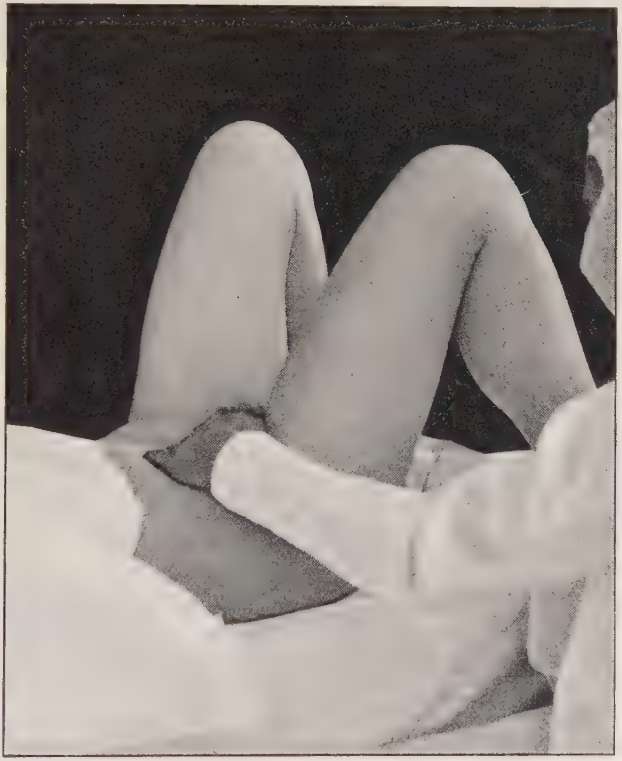

Fig. 99.—The examination of a patient in the modified dorsal position. In actual practice the patient, when not anaesthetized, is covered with a sheet, but in the above illustration for the sake of clearness she is uncovered. For the same reason the examiner is standing further away from the patient than he would in ordinary circumstances.

As a rule most practitioners use the right hand for the vagina or vagina and rectum, and the left to make counter pressure on the abdomen. It is far better, however, to cultivate ambidexterity, as in private houses it is not always convenient to have the patient on the left side. It is better also, when the size of the vagina permits, to use both the first and second finger in the vagina instead of only one finger; if it be thought advisable a recto-vagino-abdominal examination can always be made afterwards, care being taken not to infect either passage from the other. It is only necessary to describe here the bimanual method with two fingers in the vagina, as the others are merely modifications.

The two fingers well lubricated, and gloved if necessary, are gently insinuated into the vagina, making slight pressure on the perineum, and passed slowly on until the cervix is reached. Counter pressure is now made with the other hand above the symphysis pubis in order to bring the pelvic organs within easier reach of the examining fingers. At this stage, the forefinger in the vagina should lie in the anterior cul-de-sac and the second finger in the deeper posterior pouch—the cervix lying between them (fig. 100). By pressing steadily with the hand on the abdomen, it becomes possible to feel that the fundus is either between the examining forefinger and the hand on the abdomen, indicating a position of uterine anteflexion or anteversion; or that the fundus lies between the second finger and the outside hand, indicating a condition of retroflexion or retroversion. Sometimes the uterus is felt to be lying straight up, neither anteflexed nor retroflexed.

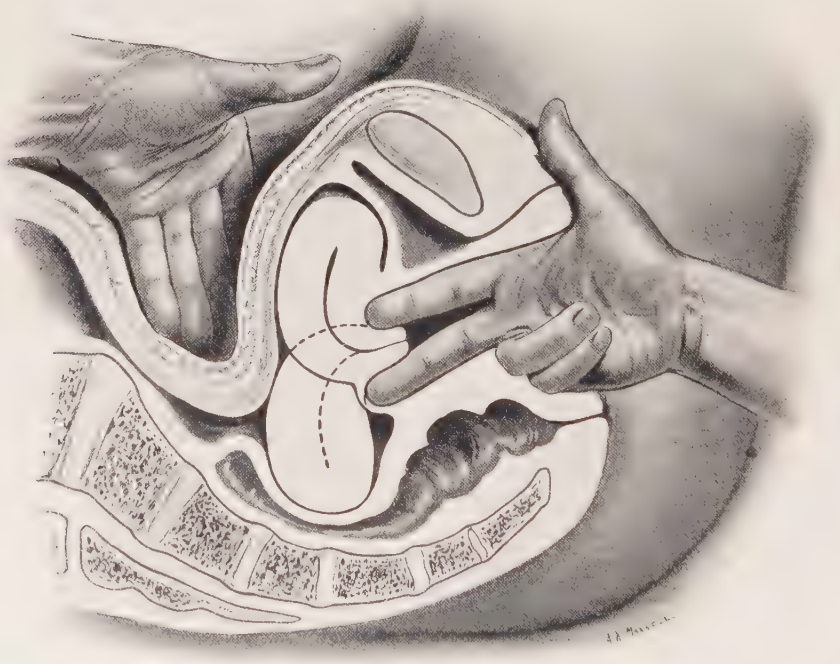

Fig. 100.—Diagram to show the method of bimanual palpation, with the patient in the left latero-prone position.

Having made out the position of the uterus in this way—lateriflexion or other displacements being diagnosed on similar principles, as will be described later—it is next necessary to discover whether

the ovaries and tubes be normal, or whether there be any pathological conditions to be made out in the pelvis.

The side nearest to the examiner is first investigated. In order to do this the two examining fingers are approximated slightly at the side of the uterus, and with the assistance of counter pressure from above are passed up the side of the uterus as far as the elasticity of the parts will allow. Roughly speaking the fore-finger is pushed up in front of the broad ligament and the second finger behind that structure (with the second finger in the rectum, the latter is more easily possible). The tube on that side is then palpated; if thickened it may be readily felt. The normal tube, however, is not easily defined.

With the fingers still in this position, they are alternately gently flexed towards and extended from the wall of the pelvis. In this way the ovary is frequently caught between the examining fingers and the pelvic wall. This organ may be recognized as a smooth, solid, mobile body which readily slips from under the fingers, causing a sickening and slightly painful sensation to the patient.

Any abnormal thickening or swelling can be readily defined between the examining fingers and the hand exerting counter pressure on the abdominal wall. The consistency, mobility and attachments of any pathological 'mass' must be made out in this way.

It is very important to differentiate between 'masses' attached to the uterus and those independent of that organ. Sometimes this is extremely difficult, but as a rule care will enable the examiner to arrive at a right conclusion. He should attempt to fix the uterus by grasping the cervix with the two examining fingers in the vagina, and then to move the pathological 'mass' with the hand on the abdomen, noting whether the uterus be also moved in the process; and contrariwise, he should next waggle the uterus with the fingers in the vagina and note whether any movement be communicated to the 'mass' under the examination of the hand on the abdomen. If the 'mass' be entirely pelvic, the practitioner has to rely on the fingers in the vagina for communicating all movements to the various parts under investigation.

A similar series of manoeuvres is then carried out on the other side of the pelvis. Since the finger cannot be flexed in the opposite direction, if a very exact examination be necessary it is better to change sides and hands, or to place the patient in the modified dorsal position by means of which the same hand as before can be employed.

There is one point of practical importance to the student which may be mentioned here. It is necessary to learn at once to distinguish faecal collections. This can always be accomplished easily by fixing the 'mass' under the finger, and pressing upon it in order to

cause flattening and indentation. It is surprising how many mistakes may be made through neglecting this simple precaution.

Before leaving the subject of vaginal examination some reference is necessary to the uterine sound (fig. 101). This is an instrument which is being used less and less for diagnostic purposes, owing to the

Fig. 101.—Uterine sound.

many dangers surrounding its use in unskilled hands, among which may be enumerated the following: perforation of the uterus, conveyance of infections to the uterus, and the disturbance of an early pregnancy. Complicated methods have been described for the insertion of this instrument. There is only one safe and proper method. After the vagina has been thoroughly purified with an antiseptic solution, and a duckbill speculum inserted, the cervix is steadied by seizing the anterior lip with a volsellum forceps (fig. 102). The cervix is again

Fig. 102.—Light volsellum forceps.

swabbed, and the sterilized sound is then passed direct into the uterine cavity with every care and gentleness.

The sound should only be used to measure the length and direction of the uterine cavity, but it is of very little assistance, in the majority of cases, to anyone accustomed to careful bimanual examination; for the diagnosis of malformations, inversions and fibromyomata of the uterus this instrument is, however, sometimes valuable.

Rectal examination.—With the recent introduction of the proctoscope and sigmoidoscope a thorough **inspection** of the rectum and lower parts of the pelvic colon is practicable; but as this is strictly speaking beyond the immediate range of gynaecology, it is not necessary to do more here than to indicate the possibility of these methods as accessory to a gynaecological examination. Malignant invasion of the rectum from the cervix uteri, rectal fistula from ectopic pregnancy and so on, are gynaecological conditions in which inspection of the rectum may be necessary.

Palpation of the rectum may be direct or bimanual, with or without a finger in the vagina. Sufficient has already been said under bimanual vaginal examination to indicate the advantage of the rectal route in many cases of pelvic disease.

Vesical and urethral examination.—As with the rectum it is often necessary for the gynaecologist to examine the bladder and urethra. **Inspection** is carried out by means of the cystoscope, with which every student becomes familiar in ordinary routine surgical work. Growths of the bladder, malignant invasion, fistulae and other pathological conditions are readily inspected. Vesical **palpation** is carried out by means of the bimanual method with one or two fingers of one hand in the vagina and the other hand above the symphysis pubis to make counter pressure. Sometimes it is necessary to dilate the urethra and to examine the interior of the bladder with the finger or sound.

The **genufacial (genupectoral) position.**—While the latero-prone and dorsal positions are commonly used the genufacial is sometimes

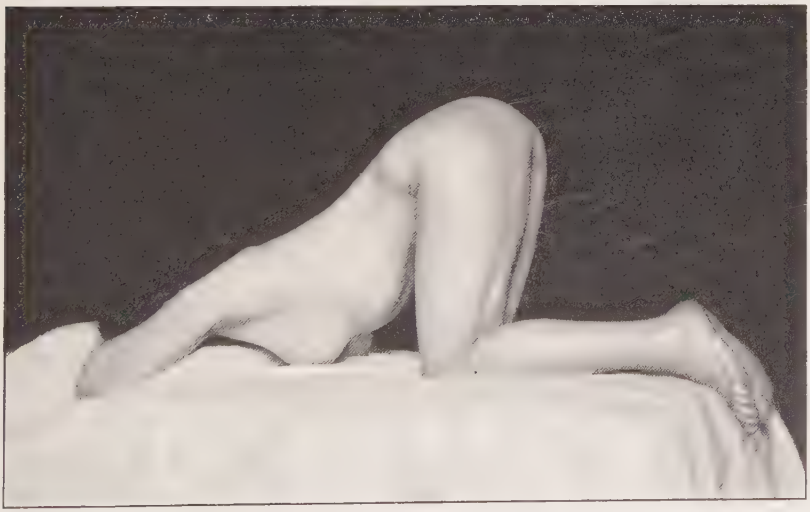

Fig. 103.—The genufacial position.

of great assistance in the examination of the bladder, rectum, and occasionally of the vagina, and must, therefore, be described here. As will be seen later it is also frequently used in the treatment of backward positions of the uterus.

The patient is made to kneel on the couch or operation table with the feet over the end. She next bends her body forwards, flexes the

forearms and brings them together side by side upon the couch. She then rests the side of her face upon them, assuming a position of Eastern supplication, except that for comfort the face is turned to one side and rested upon the forearms (fig. 103). With the patient in this position a negative intra-abdominal pressure is caused, so that when air is admitted to the bladder, rectum, or vagina these cavities are 'ballooned,' and a more satisfactory inspection of their interiors thereby obtained. The fundus of the uterus if retroverted is, too, at a lesser mechanical advantage in the matter of gravity and pressure, and can, therefore, be more readily replaced.

Fig. 104.—Anaesthetized patient fixed in the genufacial position. (*After Kelly.*)

It is sometimes necessary that the patient should be under the influence of an anaesthetic. In these circumstances the position can be easily obtained and maintained by securing the stirrups, which are attached to the lithotomy supports of the operation table, around the upper part of the thighs (fig. 104); or a piece of flannel bandage or a roller towel may be passed round the top of each thigh and carried over the shoulders of an assistant—one on each side—standing with his back to the patient. In these circumstances the anaesthetist looks after the head of the patient.

Skiagraphy.—Since the introduction of the X-rays, skiagraphy has been available for the detection of foreign bodies in the bladder, rectum, genital passages and pelvis, and for the demonstration of foetal bones, especially in advanced ectopic pregnancies. No special description of the details of the method of application is called for here.

CHAPTER V.

CONGENITAL DERANGEMENTS OF THE NORMAL ANATOMICAL CONDITIONS (MALFORMATIONS).

Since these abnormalities arise as the result of imperfect, incomplete, or abnormal development it will be obvious at once that malformations are frequently multiple. It is therefore somewhat difficult to deal with each part of the genital tract separately in regard to these conditions. Further, in certain cases the whole genital system is deranged, when inclusive consideration must be given to the conditions found. Whatever method of description is adopted, then, frequent reference to abnormalities of other parts of the genital organs will be necessary.

§ i. ABNORMALITIES OF THE OVARIES.

Absence of one or both ovaries.—Absence of both ovaries is extremely rare and probably only occurs in monsters. When one ovary is absent, there is usually an absence of the corresponding kidney and other parts developed from the intermediate cell mass of that side. The absence of one ovary is apparently of no importance in regard to the health and growth of the subject. Sufficient cases in viable individuals are not on record for us to state with certainty the results that occur in the absence of both ovaries. It is, however, said that a general infantile condition persists and that the pelvis does not develop. But as the ovaries can be removed from very young animals without any impairment of the health and growth (apart from that of the remainder of the genital system, which atrophies) it is probable that if such general defects be found they are associated with im-

perfections of the other ductless glands rather than with the absence of the ovaries alone.

Rudimentary ovaries are sometimes found. As a rule they are associated with a rudimentary condition of the other parts of the genital apparatus. There may also be arrest of the general development. Recent investigation has shown that some of these cases are dependent on congenital disease of the pituitary body.

Supernumerary ovaries.—These have been reported occasionally, but they are probably very uncommon. Some authorities state that the persistence of menstruation after double oöphorectomy is sometimes due to the presence of a supernumerary organ.

Accessory ovaries must be distinguished from supernumerary ovaries. They are not uncommon, and are merely parts of the ovary which have become pedunculated and still remain attached to the main portion of the gland.

Hypertrophy of the ovary is stated to occur. There is considerable doubt as to whether such a condition really exists as a congenital malformation. It is possible, however, that where there is only one ovary it may be larger than normal.

Non-descent of the ovaries is sometimes seen. In such cases the ovaries may remain attached in the neighbourhood of the lower pole of the kidney, or be found in any situation between this site and the inguinal region, or between it and the normal position. This condition is probably caused by the greater strength of the upper end of the urogenital mesentery (infundibulo-pelvic ligament) as compared with that of the lower end of the genital mesentery (round ligament).

§ ii. ABNORMALITIES OF THE FALLOPIAN TUBES, UTERUS AND VAGINA.

It is advisable to consider these together, since malformation of one part is frequently associated with malformation of the rest, owing to the fact that the Fallopian tubes, the uterus and upper part of the vagina are all developed from the Müllerian ducts. At the same time there are certain abnormalities which are peculiar to different parts of the Müllerian tract; these must be mentioned first of all.

ABNORMALITIES OF THE FALLOPIAN TUBES. Supernumerary tubes.—These are extremely rare, but may be associated with supernumerary ovaries.

Accessory tubes and ostia.—Accessory tubes are somewhat rare, but accessory ostia are fairly common. These may open into the normal

tube or end blindly. They are usually found surrounded with fimbriae and situated near the fimbriated extremity of the main tube (fig. 105).

Abnormal attachment of the tubes to the uterus.—Sometimes the tubes have been found implanted in the uterine wall low down. There is no satisfactory explanation of this extraordinary malformation, which does not accord with the usual view of the fusion of the Müllerian ducts.

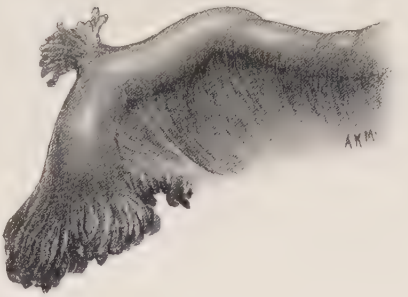

Fig. 105.—Fallopian tube with accessory ostium.

ABNORMALITIES OF THE UTERUS. Accessory uterus.—This has been described, and the only explanation that can be given of this malformation is that the accessory organ (which is always attached to the uterus proper) is an outgrowth or diverticulum from the Müllerian duct.

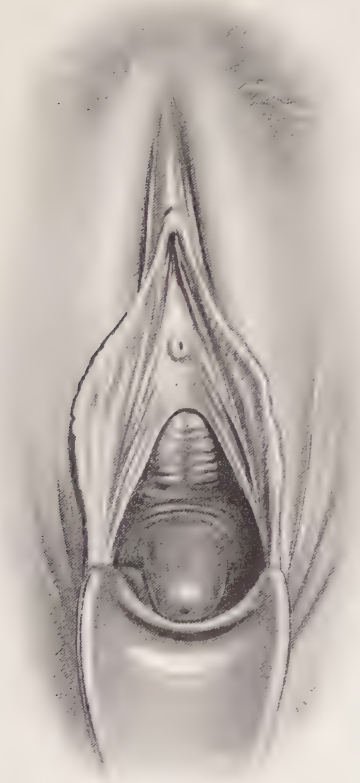

Fig. 106.—Congenital stenosis of the external os uteri ('pin-hole' os) associated with a small conical cervix.

Congenital hypertrophy of the cervix.—This is quite a different condition from the hypertrophy and elongation of the cervix which is seen in cases of prolapse of the vagina to be described later.

In congenital hypertrophy the vaginal cervix is found to be long, sometimes even reaching as far down as the vulval orifice.

The diagnosis from uterine prolapse is easy. Physical examination reveals the fact that the vaginal vault is in the normal position; and on examining with the sound the uterine cavity, from the external os to the fundus, is found to be lengthened in proportion to the length of

the cervix. The treatment for this condition is amputation of the vaginal cervix (see p. 497).

Conical cervix and 'pinhole' os uteri—conditions which are explained by their names—are usually associated, but may exist as malformations independently of one another. The cervix is generally rather small (fig. 106), but is occasionally hypertrophied.

Patients with this condition are found to be sterile, probably owing to the difficulty experienced by the spermatozoa in gaining access to the uterine cavity. The treatment is described on page 495.

The other defects that occur in the Fallopian tubes, uterus and vagina may now be described together.

COMBINED DEFECTS IN THE DEVELOPMENT OF THE MÜLLERIAN TRACT.

Absence and rudimentary conditions.—Absence of Fallopian tubes is extremely rare; when such is found absence of the uterus, if the deformity be bilateral, or of one half, if only one tube be missing, is invariable. When the uterus is not present the vagina, or at least the upper two-thirds, is also missing. Sometimes the fimbriated extremity of one Fallopian tube, or of both, is absent.

The Fallopian tubes, however, may not only be present but be quite normal, with absence of uterus and vagina. When the vagina is not formed, and the tubes and uterus are present, the uterus is usually in a rudimentary condition. This rudimentary condition of the uterus, with normal Fallopian tubes and ovaries and an absence of vagina, is not uncommon. A rudimentary uterus is generally imperforate and forms a hard, fibrous mass. It is impossible to discuss here all the various reasons that have been put forward to account for the absence, or rudimentary development, of the different parts of the Müllerian duct which go to form the various portions of the genital apparatus under discussion. Foetal peritonitis, pituitary disease and many other causes have been said to account for these conditions.

Clinically, primary amenorrhoea is most often the symptom which causes the patient to seek advice.

Unfortunately nothing can be done to make the woman fit to fulfil her part in the scheme of the universe. Generally, if the ovaries be functional, the patients have good health and are capable of leading an active if non-sexual life. Sometimes, however, these patients suffer from hystero-epilepsy (see p. 209), the treatment for which consists, in these special cases, in the removal of one or both ovaries.

The **infantile uterus** can hardly be be looked upon as a malformation for it is merely a condition of arrested development, the uterus, Fallopian tubes, and often the ovaries retaining the infantile form after puberty from some disordered condition of the general metabolism.

Defects due to failure of the Müllerian derivatives to fuse in the normal manner.—These abnormalities only involve the uterus and vagina, and the following conditions may be found:

Uterus unicornis.—This is an extremely rare abnormality. It is produced by the total suppression of the Müllerian duct of one side, so that there is only one Fallopian tube and the corresponding uterine horn (fig. 107 A). The vagina must naturally be of the lateral type since it has only been formed in connexion with one Müllerian duct. Most of the cases of uteri unicornes described in museums and text-books are cases of uteri bicornes in which one uterine 'horn' is extremely rudimentary, and the tube of that side is attached low down to the well developed uterine 'horn' of the other side, to which is also attached at its fundus the corresponding Fallopian tube.

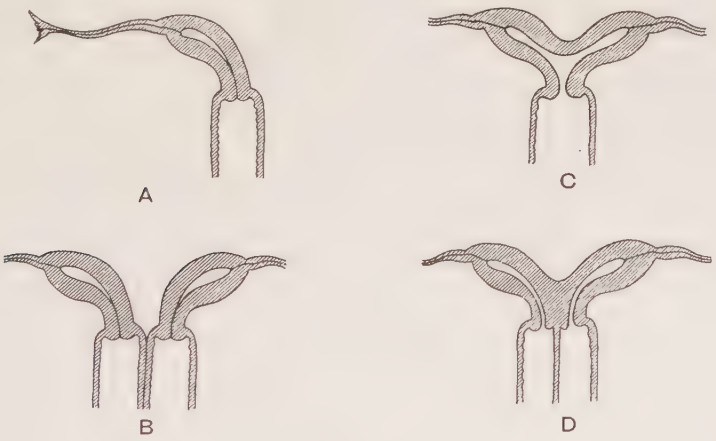

Fig. 107.—Diagram representing the abnormal conditions that may be found owing to the imperfect fusion of the uterine portion of the Müllerian ducts. A. Uterus unicornis. B. Uterus didelphys with double vagina. C. Uterus bicornis unicollis. D. Uterus bicornis duplex with septate vagina.

Uterus didelphys.—This condition implies entire separation of the two halves of the uterus (fig. 107 B). That is to say, no fusion takes place in those parts of the Müllerian ducts from which the two halves of the uterus are formed. Various reasons have been given for this state of affairs, but none have been generally accepted. The most probable reason, as we have already seen, is that the destination of the Müllerian ducts in regard to their coalescence is controlled by the

subperitoneal muscular fibres, and that these do not always produce a normal effect. Other supposed causal factors are shortness of the round ligament and the interposition of a vesico-rectal ligament or septum, which is sometimes found with divided conditions of the uterus. With uterus didelphys we generally find a double vagina; sometimes, however, the two cervices open into a common vagina, as in the rabbit (fig. 9 B, p. 8). When rudimentary the uterine bodies are usually widely separated, sometimes being located in the inguinal canal (*ectopia genitalium*). In these cases the vagina, or upper two-thirds of it, is absent.

As a rule the genital organs in cases of uterus didelphys, when found in adults, are functional and not rudimentary; for when there is a rudimentary condition of the uterus didelphys there are generally other malformations, such as spina bifida, which lead to the early death of the individual.

Uterus bicornis.—This is the next stage of incomplete fusion, being a step higher towards the perfect uterus of woman considered from an evolutionary and developmental standpoint.

In this abnormality the lower part of the uterus is formed of the fused or partially fused Müllerian ducts, while in the upper part, the two 'horns' of the uterus remain separate. These 'horns,' or unfused uterine bodies, may be of the same size, or they may be very unequal. Sometimes one 'horn' is rudimentary; occasionally both are.

In bicornuate conditions one 'horn' or both may be imperforate. The cervix may be single (*uterus bicornis unicollis*) (fig. 107 C) or double (*uterus bicornis duplex*) (fig. 107 D). The vagina may be septate, subseptate or single.

Pregnancy may take place normally in these forms of uterus. Sometimes, however, when pregnancy occurs in the rudimentary 'horn' of a uterus, all the symptoms and dangers of a tubal pregnancy may be met with (see p. 229).

With these malformations menstruation is usually normal, or at least only liable to the same disorders as those found in the normally developed uterus.

Uterus septus.—Any degree of completeness of the septum may be found, and frequently in conjunction with a septate condition of the vagina. Externally the septate uterus may be normal in shape, although sometimes slightly large. Internally it is divided in the antero-posterior plane by a septum. This may extend from the fundus down to the external os, which is therefore double; or the uterine cavity may be divided while the cervix is single (*uterus subseptus unicollis*) (fig. 108). The vagina is frequently double, that is to say septate; but it may be single. As a rule menstruation and pregnancy are normal. Labour, however, is sometimes difficult. Subsequent pregnancies

generally occur on the same side as before, probably because, when the vagina is also septate, penetration by the male organ and impregnation always occur on the same side.

Septate vagina may occur in the absence of a septate condition of the uterus, as well as in conjunction with it (fig. 108).

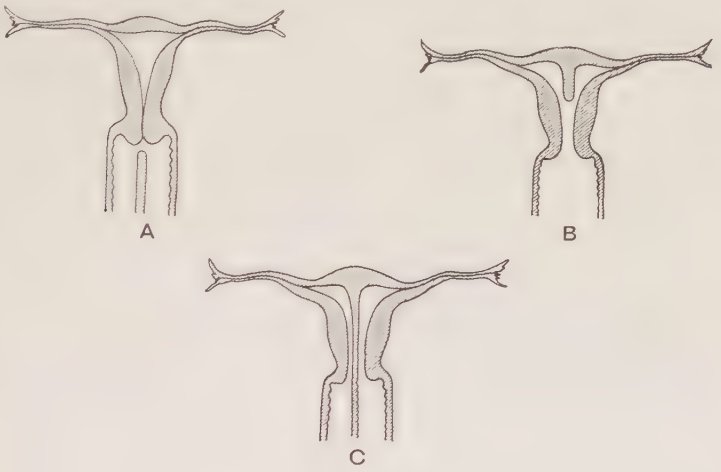

Fig. 108.—Septate conditions of the vagina and uterus.
A. Septate vagina. B. Septate uterus. C. Septate uterus and vagina.

When the uterus and cervix are single the vaginal septum ends above in a free crescentic margin (fig. 108 A). These vaginal septa are extremely vascular, and when existing with a normal uterus should be divided if discovered; otherwise serious haemorrhage may occur in parturition, should laceration take place.

Atresiae of the genital tract.—Congenital atresiae may occur anywhere in the course of the genital channels, and generally speaking it may be laid down that all parts of the passages below a *congenital* atresia are obliterated. Thus the obliteration of the lower parts of the Fallopian tubes when truly congenital is associated with an absence or imperforate condition of the uterus and vagina. A rudimentary uterus, which is usually imperforate and consists almost entirely of fibrous tissue, is associated with absence of vagina, or of the upper two-thirds of the passage which are developed indirectly from the Müllerian ducts. An exception to the above statement may be found in some cases of atresia of the cervix, when the uterus is otherwise apparently normal and the vagina is also patent.

Atresiae do not, however, entail maldevelopment of the genital channels above; thus a rudimentary and imperforate uterus may exist with perforate tubes.

Atresia of the cervix, while rare in an otherwise normal uterus, is not uncommon in one half of a bicornuate uterus with a double cervix, and it is possible that in these cases atresia of the cervix exists with suppression of the corresponding half of the vagina. Thus we may have also a condition of *lateral vagina*, in which only one half of the passage is developed.

Atresia of the vagina alone is not rare, indeed it is most commonly seen at the lower end forming the so-called 'imperforate hymen.' Most of these cases have nothing to do with the hymen, but are the result of the imperfect tubulation of the vagina, the lower end being imperforate. In these circumstances, the hymen, if carefully looked for, may be seen spread out over the resistant end of the vagina, which bulges if there be a condition of haematokolpos (fig. 109). In other cases the atresia may be much more complete and extend from the cervix downwards, and in these the vaginal canal is never formed in respect to the portion derived from the Müllerian ducts. The lower portion—formed from the urogenital sinus—may, however, still exist.

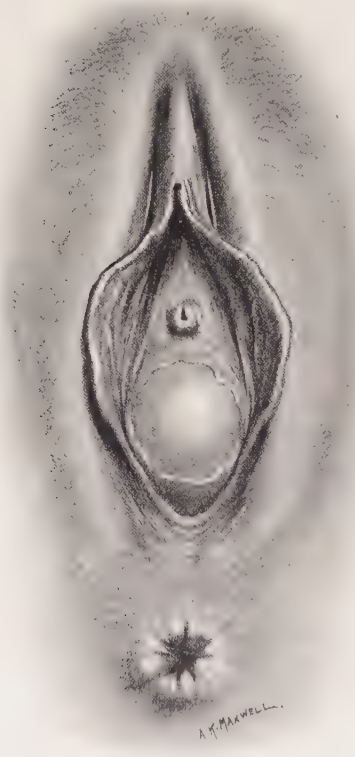

Fig. 109.—Imperforate vagina.

Lastly **atresia of the hymen** is seen more rarely. This is not always congenital; it is sometimes due to vulvitis in childhood.

It must be remembered that atresia of the vagina or hymen may, like atresia of the cervix, occur on one side only when the Müllerian ducts have failed to fuse in the normal manner; in these circumstances the menstrual discharge may be retained on one side and flow normally from the other.

Retention of the menstrual discharge.—With atresia of the cervix or any portion of the vagina, if the organs above the occlusion be

functional there is a retention of menstrual discharge after puberty. Even before this, mucus may collect above the obstruction. The retained fluid is of a typical dark brown or red colour and very thick in consistence. It is composed of large quantities of mucin, altered blood pigment, many white blood corpuscles and epithelial cells.

Usually no advice is sought until attention is called to the protracted absence of the catamenia. Before this is noticed the patient may suffer from severe pain in the back, which becomes worse each month in association with other menstrual *molimina* such as headache and abdominal pain. The patient also frequently complains of dysuria. If she should marry, coitus may be found to be very painful if not impossible. In time the patient may notice an abdominal tumour or a bulging 'lump' between the labia which causes discomfort or pain on walking. The diagnosis is easy: the history, and the presence of a

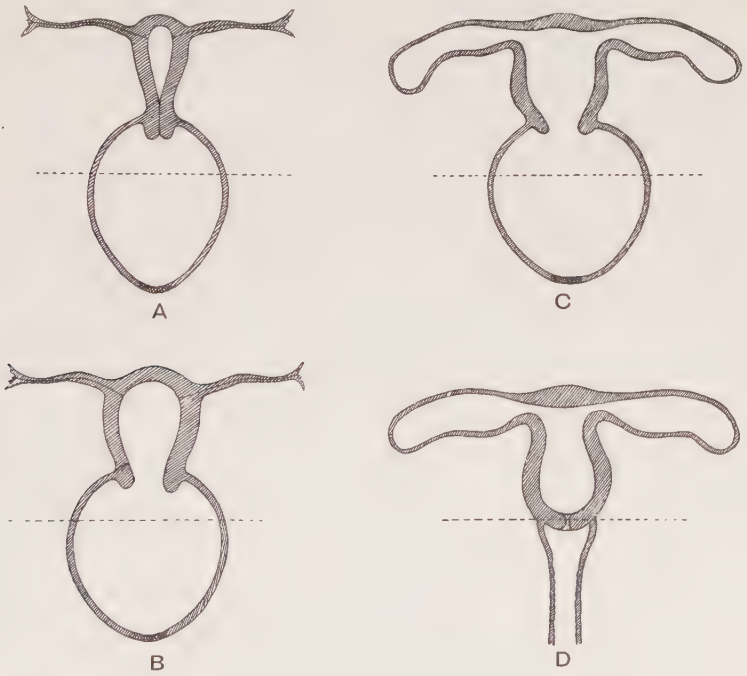

Fig. 110.—Menstrual retention in atresia of the vagina (A., B. and C.) and cervix uteri (D.). A. Haematokolpos. B. Haematokolpos and haematometra. C. Haematokolpos, haematometra and haematosalpinx. D. Haematometra and haematosalpinx with atresia of cervix.

large uterus with imperforate cervix or of a fluctuating tumour with an imperforate condition of the vagina, prevent any mistake.

These degrees of menstrual retention are shown in fig. 110.

When the vagina alone is distended the condition is called *haematokolpos*; when the uterus is also distended there is in addition *haematometra*; this is associated with *haematosalpinx* when the tubes are also filled with the menstrual discharge which has been forced into them from the uterus.

Haematometra and haematosalpinx are most commonly seen associated with atresia of the cervix. It must be very rare for these conditions to follow atresiae of the lower end of the vagina or hymen; indeed with the vagina so much distended that the tumour reaches above the umbilicus the undilated uterus may be felt riding on the top. The prognosis in respect to complete functional recovery is good when there is haematokolpos alone, but bad otherwise.

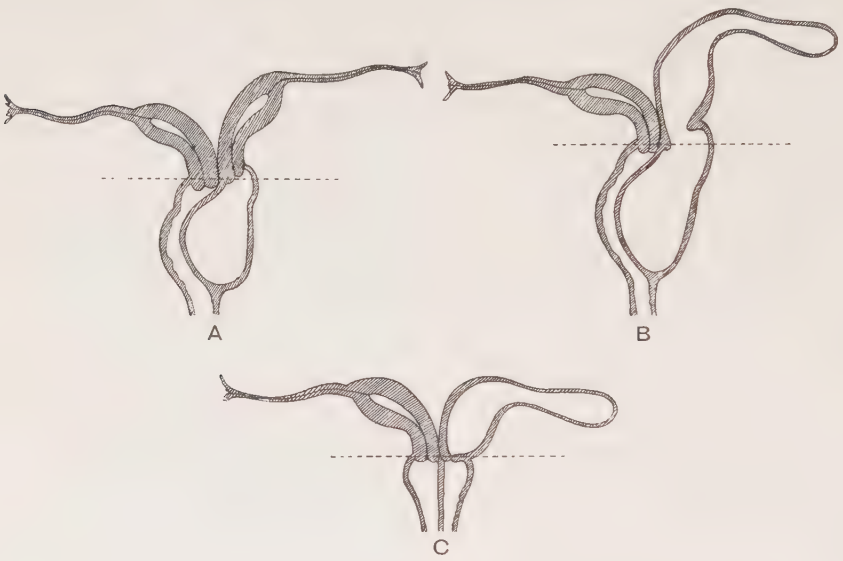

Fig. 111.—Menstrual retention with a divided condition of the uterus and vagina. A. and B. represent the results of atresia in a lateral vagina. A. Haematokolpos. B. Haematokolpos, haematometra and haematosalpinx. C. represents the results of atresia of one cervix—haematokolpos and haematosalpinx.

The state of affairs obtaining with atresiae in divided conditions of the genital passages is illustrated in figure 111.

The treatment of these conditions is discussed on page 193.

It may be mentioned, however, that the formation of an artificial vagina is sometimes called for, but the technique of the procedures devised for this purpose are complicated, and since such operations are rarely justifiable, they will not be described.

§ iii. ABNORMALITIES OF THE VULVA.

The commonest abnormalities are in connexion with pseudo-hermaphroditism, which will be considered separately. First of all we must briefly consider malformations due to developmental errors unconnected with the determination of sex or the fate of the urogenital sinus.

Double vulva has been seen occasionally. In most cases there have been supernumerary lower limbs.

Absence of vulva has occasionally been recorded in conjunction with other abnormalities such as imperforate anus. The subjects of such extensive malformation are invariably non-viable.

Rudimentary vulva is occasionally seen in women in whom the internal genitals are rudimentary or absent. The condition is, therefore, of clinical importance as indicative of the fact that other anomalies are also present.

Hypertrophy of the labia minora is sometimes seen as a congenital condition. It is a racial characteristic in the Hottentots.

Atresia of the labia occurs very rarely as a congenital malformation ; it is more frequently seen as the result of inflammatory processes in childhood or infancy. Difficulty of micturition, and, later in life, menstrual retention or the impossibility of coitus owing to the adhesion of the labia minora or even of the labia majora, are the clinical features that attract attention.

Abnormalities of the hymen.—The form of the hymen is so variable in woman that it is impossible to say that any hymen is abnormal merely because the opening or openings through it into the vagina are unusual. So long as the membrane is thin and perforate it must be looked upon as normal.

Absence of hymen has been recorded, but it is doubtful whether such apparent absence is not often due to the fact that it is very slightly formed.

Imperforate hymen is not common. As has already been stated the majority of cases recorded as 'imperforate hymen' are examples of atresia of the lower end of the vagina.

Undoubtedly atresia or absolute imperforation of the hymen does occur, and may lead to an exactly similar state of affairs to that related under the description of atresia of the vagina.

Resistant hymen.—Sometimes the hymen although perforate is abnormally thick and unyielding. This may give rise to dyspareunia owing to the impossibility of penetration. In these cases it is advisable

to excise the hymen in order to ensure painless coitus. If the hymen be merely split the edges are apt to remain tender.

Epispadias is extremely rare. The deformity may be simple and uncomplicated, when the upper wall of the urethra is absent and the clitoris is split in two. The channel thus formed disappears behind the symphysis pubis into the bladder. Sometimes, however, only the distal portion of the urethra is involved. Patients with this deformity have a limited degree of continence.

In the complete form the malformation is connected with ectopia vesicae and failure of the pubic bones to unite in the middle line. Spina bifida is also frequently present.

§ iv. ABNORMALITIES DUE TO DEFECTS IN THE PARTITION OF THE CLOACA AND UROGENITAL SINUS.

It has been demonstrated already that at an early stage in the development of the foetus the bladder and rectum open into a cavity known as the cloaca which is only separated from the surface of the body by the cloacal plate, the remnants of which eventually form the hymen. As development proceeds, the cloacal cavity becomes divided by septa—the vesico-vaginal and recto-vaginal—into rectum, lower part of the vagina and base of the bladder and urethra. In some cases the development of these septa is arrested and we find the condition known as *persistent cloaca*. At other times the rectum is divided off, but the downgrowth of the vesico-vaginal septum is arrested and we have a *persistent urogenital sinus* (*hypospadias*) into which the bladder and upper portion of the vagina open.

Persistent urogenital sinus (hypospadias).—This deformity is much commoner than epispadias, and is found in varying degrees of completeness. Thus in the minor degree there is a long and narrow canal beneath the clitoris, into which the urethra and vagina both open high up. It would appear therefore as if the vagina was absent; but what really happens is that the lower part, which is usually formed from the urogenital sinus, has been narrowed in the attempt to form a urethra in the absence of a downgrowing vesico-vaginal septum. (Cf. fig. 21 B, p. 20 and text.) Patients who have this condition can generally retain their urine, and the menses escape by the common channel.

In the major deformity there is a wide, open, urogenital sinus which involves the base of the bladder and urethra, the downgrowing septum which divides the vagina from the urethra not being developed (fig. 112). With this state of affairs incontinence of urine always

occurs. The clitoris is frequently found to be enlarged with all degrees of hypospadias.

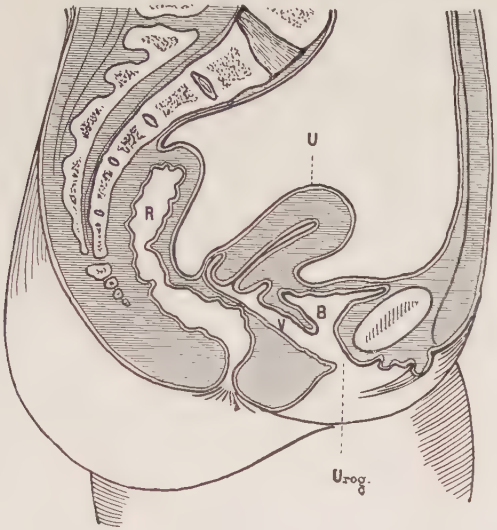

Fig. 112.—Diagram to show the condition of affairs in hypospadias.
U. Uterus. *B.* Bladder. *V.* Vagina. *R.* Rectum. *Urog.* Urogenital sinus.

Persistent Cloaca.—In most of these cases the patient has little or no control over the passage of faeces and urine. The only method of treating this condition is by plastic operation. Such procedures are not very satisfactory, and therefore should not be undertaken if the patient have any degree of control and can be properly looked after. Fortunately this malformation is very rare in viable children.

§ v. TRUE HERMAPHRODITISM AND PSEUDO-HERMAPHRODITISM.

As we have already seen, so far as naked-eye appearance is concerned the sex of any foetus is quite undecided in the early stages of development. A normal male or female can therefore only be developed when a definite line is taken during the later stages. If, however, the determining factors do not exclusively assert themselves, then one of the abnormal states of affairs to be described may be found.

TRUE HERMAPHRODITISM may be defined as the condition in which *the subject possesses both a testicle and an ovary.* It is said that an ovary and testicle may be found on each side of the body (**bilateral**

hermaphroditism); or an ovary on one side and a testicle on the other **(lateral hermaphroditism)**; or even an ovary and a testicle on one side while there is a testicle *or* an ovary on the other **(unilateral hermaphroditism)**.

In the conformation of the external genital organs usually there are abnormalities, and the secondary characteristics may be either masculine or feminine.

Cases of true hermaphroditism must be extremely rare, and can only be accepted as such when a full dissection of the pelvis and a microscopical examination of the genital glands have been made.

PSEUDOHERMAPHRODITISM.—This is by no means uncommon. It is a condition in which the subject possesses either *ovaries* or *testes*, while the formation of the external genitals, as well sometimes as that of the internal organs, is abnormal and frequently misleading in regard to sex identification.

The sex of the individual depends, of course, upon the possession of ovaries or testes. In the former case the patient is a female pseudohermaphrodite, in the latter a male pseudohermaphrodite. Male pseudohermaphrodites are far commoner than female. It is usual to classify each of these types into three groups according to the anatomical conditions to be found.

(1) **Internal male** or **female pseudohermaphroditism,** where there are testes or ovaries in association with external genitals corresponding to the genital gland—male with testes, female with ovaries. In the case of a male, however, a uterus, Fallopian tubes and vagina, or some part of a persistent Müllerian duct is found.

In the female, on the other hand, there are the remains of a persistent Wolffian duct.

(2) **External pseudohermaphroditism.**—In this group the external genitals are of the opposite character to the genital glands. That is to say in males there are testes with female external genitals (and perhaps general bodily appearance); and in the case of the female pseudohermaphrodite there are ovaries with external genitals tending towards the male type.

(3) **Complete pseudohermaphroditism.**—Here we find that in the male the testes are the only indication of sex, the Müllerian ducts being persistent and the external genitals of feminine form. In the female this state of affairs is reversed.

It must be remembered, of course, that where the Müllerian ducts persist in the male pseudohermaphrodite and a *uterus masculinus* is formed the development of this is not often very complete. The same remark applies to those cases in which the Wolffian ducts persist in

the female. Further, it is to be noted, that the external genitals in these cases are generally imperfectly formed, but tend towards the male or female type as the case may be.

It is always necessary to make quite sure that the case is not merely one of hypospadias in a male, with perhaps non-descent of the testicles; nor one of enlarged clitoris in a female with hernia of the ovaries into the labia. Adherent labia or an infantile penis may also give rise to some doubt until properly investigated. Many subjects of hermaphroditism and pseudohermaphroditism are mentally deficient or afflicted, others become notorious as bearded women and similar monstrosities.

Sometimes pseudohermaphrodites menstruate even when of the male sex, so that great care is often necessary in making a sex determination. Indeed this may be impossible without a pelvic dissection. Pseudohermaphrodites have frequently been married to individuals of their own sex, so that sexual instincts probably count for nothing.

If there be a reasonable doubt as to the sex, after a careful examination by an expert, the child should be brought up as a boy; firstly because male pseudohermaphrodites are much commoner than female—some authorities assert that they form ninety per cent. of all cases—and secondly because there is less chance of a male hermaphrodite not finding out his sexual limitations before attempting matrimony. If the individual be brought up as a girl marriage in ignorance of the true state of affairs is quite likely to take place.

CHAPTER VI.

ACQUIRED DERANGEMENTS OF THE NORMAL ANATOMICAL CONDITIONS: INJURIES.

§ i. INJURIES TO THE VULVA AND VAGINA.

The external genitals are liable to all the injuries which follow violence, and it is unnecessary here to deal with lacerations caused by the patient falling upon spikes, or by sharp instruments, for these must be treated as ordinary surgical wounds.

HAEMATOMA OF THE LABIUM MAJUS.—This is a condition frequently seen. It may follow a kick, a fall astride anything hard, or it may occur during parturition. The last is an uncommon cause, the haematoma in these circumstances being generally produced by the rupture of a varicose vein.

The **symptoms** complained of in haematoma of the vulva are pain, tenderness and swelling of the part.

The **diagnosis** must take into account the other painful swellings of the labia majora, such as strangulated inguinal hernia in the upper part of the labium in a fat woman; cyst or abscess of Bartholin's gland; oedema due to gonorrhoea or to some other infective cause. With a recent haematoma the labium is generally much discoloured, and there are usually no signs of inflammation. The onset is sudden, and there is a history of direct injury. Sometimes a haematoma becomes infected and suppurates, in which case one can often do no more than surmise as to whether one has to deal with an abscess of Bartholin's gland and duct or with a breaking down haematoma.

Treatment consists of putting the patient to bed, and applying ice if the case be seen early. This may prevent further effusion, and the blood may be absorbed. If seen later, and the haematoma appear to be breaking down, hot fomentations should be used. If an abscess form an incision must be made into it, and the cavity drained with gauze

for a few days. When the haematoma is due to a ruptured vein it may be necessary to remove the clot, and to excise the vein concerned.

LACERATION OF THE HYMEN.—During the first act of coitus the hymen is usually ruptured if penetration of the penis be accomplished (see fig. 26, p. 25). This is accompanied by slight bleeding, which is of no moment under ordinary circumstances when the parts are elastic and the woman complacent. In cases of rape, however, in which the woman resists, or when the subject is very young or very old, extensive lacerations may occur and give rise to a good deal of bleeding. If called upon to treat a case of haemorrhage from laceration of the hymen the practitioner should pack the bleeding spot with absorbent wool or gauze, moistened with adrenalin solution (1 in 1000). Should this not check the haemorrhage bleeding points must be sought for, caught in artery forceps, and tied.

LACERATION OF THE PERINEUM AND LOWER END OF THE VAGINA.—This only occurs at childbirth or as the result of operative procedures carried out by the vaginal route. In the latter the perineum may be deliberately divided in order to obtain room, and subsequently repaired (see p. 503). Sometimes, too, during labour the practitioner, seeing that a bad tear is inevitable, may himself make *lateral* incisions in the perineum in order to prevent a tear into the rectum. These incisions are repaired immediately after delivery.

There is no doubt that the patient's age is a predisposing factor of considerable importance in laceration during childbirth, and that the rigid vaginae and perinea of elderly primiparae are specially prone to injury.

The ordinary laceration of the perineum which the gynaecologist is called upon to attend to is *always associated with some degree of laceration of the lower part of the vagina*, and is the result of labour. In some cases lacerations of other parts of the vulva are found associated with the more common form of injury.

Laceration of the perineum may be *incomplete* and amount to a small slit in the fourchette, or to a deep tear (fig. 113); on the other hand it may be *complete* and extend right through the perineum into the rectum (fig. 114). In exceptional cases there is a central perforation of the perineum, through which the child may be born (fig. 115). Sometimes there is extensive vaginal and perineal laceration without rupture of the skin; this is called *internal laceration*. It is usually taught that if an immediate repair of the perineum and vagina be carried out no great harm results. But such a statement is not always warranted by the result. The fact is, however, that slight

lacerations may be closed with sutures at the time, and if the parts be examined after involution the result found to be very good. In these cases it is very doubtful whether the sutures be altogether responsible for the result: no doubt ordinary cicatrization without primary union

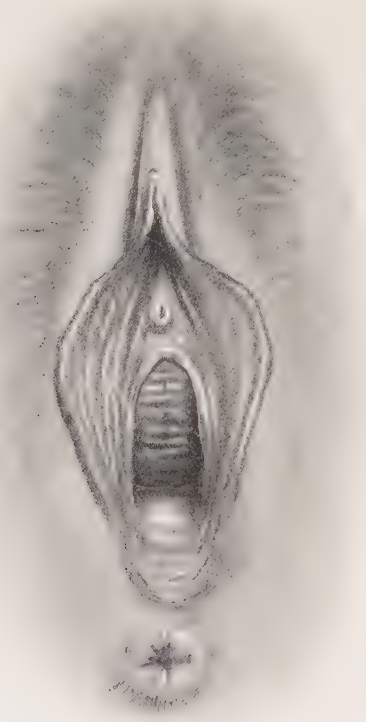

Fig. 113.—Incomplete laceration of the perineum. The vaginal mucous membrane overlying the rectum is bulging and forming a rectocele.

closes many small lacerations, especially if the patient's legs be kept together. In the worst cases, in which the tear reaches or lacerates the bowel, it is not always possible for the general practitioner to effect a satisfactory *immediate* repair in the circumstances in which he is ordinarily placed, especially if the patient be in an exhausted condition; but if the operation be deliberately carried out the next day with all proper assistance, and with the patient in the lithotomy position, and due care be subsequently taken in regard to the management of the bowels and lochial discharge, a good result can nearly always be obtained.

It is, therefore, often advisable, when such an accident occurs, that the practitioner should arrange to carry out the operation for the repair of the laceration on the following day with the advantage of proper assistance and a good light, rather than attempt immediate suture in adverse circumstances.

It is most important, however, to avoid lacerations by preventing, instead of bringing about, too rapid delivery, and by avoiding the unnecessary use of forceps.

In repairing these injuries, after cleansing the parts and placing a small pack of gauze in the cervix to stop the lochial discharge for

Fig. 114.—Complete laceration of the perineum. The torn edges of the sphincter ani have retracted to the positions indicated by the dimples. The rectal mucous membrane is seen protruding at the anterior edge of the anus.

the time being, the practitioner must follow the steps described (p. 484) in connexion with the repair of the perineum by Holden's method. In the circumstances under discussion, however, no denudation of mucous membrane is necessary as the surfaces are already raw. If the

sphincter ani and bowel be torn through these must first be sutured in manner described on p. 479.

In the treatment of a case of central rupture of the perineum the perforation should be opened into the vaginal orifice, by dividing the

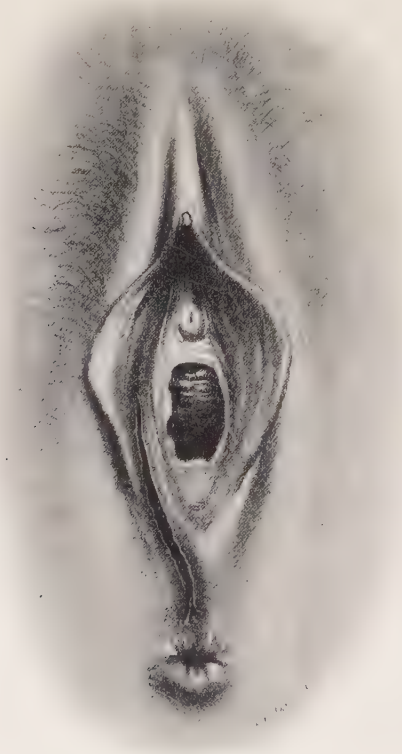

Fig. 115.—Central laceration of the perineum. In a case such as the above the child is born through the laceration, and the *ostium vaginae* remains intact.

bridge of tissue which remains, before repair is attempted, in order to reach the inevitable tear in the vagina. The operation is then carried out as for an ordinary laceration.

After early suture the bowels should be kept closed for three days, and then made to act with an olive oil enema. It is absolutely necessary, also, that in these cases antiseptic vaginal *irrigation* should be employed twice daily to prevent the accumulation of lochial discharge in the neighbourhood of the stitches. Ordinary douches must not be given, as they are apt to put a strain on the sutured parts.

When the vagina and perineum are not repaired soon after delivery, or if healing fail to take place when early repair is undertaken, an operation should always be performed subsequently as soon as possible, to prevent the incontinence of faeces that follows a laceration into the bowel, and to prevent the formation of a rectocele. These operations are fully described on pages 478 to 486.

§ ii. INJURIES TO THE VAGINA AND UTERUS.

Apart from lacerations of the posterior wall of the vagina, which inevitably occur when the perineum is torn in childbirth, and are treated by suture at the same time that the perineum is repaired, the vagina alone may be lacerated. In these cases immediate suture must be carried out in the advantageous circumstances mentioned above. Or again the upper part of the vagina may be torn in conjunction with a lacerated cervix or ruptured uterus.

LACERATIONS OF THE VAGINA.—In some cases the vagina may be injured as the result of the careless use of the forceps, which may be forced through the fornices if not properly handled when they are being placed in position. Again, in cases of criminal abortion, when a sharp instrument is passed with the intention of disturbing the contents of the uterus, the vagina may be perforated, with serious results if an opening be made into the peritoneal cavity. The rape of small children and elderly women, or any case of violent coitus in which there is great disproportion in the size of the vagina and penis, may lead to rupture of the vaginal mucous membrane. There is often profuse haemorrhage from the torn or cut surface, which later may become infected with pathogenic organisms. In these cases, whatsoever the cause, the patient must be anaesthetized as soon as the discovery is made, and the parts cleaned up. If the tear only involve the mucous membrane of the vagina this should be trimmed and carefully sutured with No. 2 chromic catgut.

When, however, important structures are injured as well as the vagina the treatment is often one of considerable anxiety, especially when the peritoneal cavity is involved. In such circumstances it is almost impossible to lay down dogmatic lines of treatment, so much depends on the prospect of sepsis supervening.

In those cases in which the injury has been inflicted, and the peritoneal cavity opened, by careless use of instruments during labour or abortion it is generally advisable to open the abdomen in order to make certain that the intestines or other structures have not been

injured. If there be no other injury the peritoneum may be brought together over the rent in the vagina (posterior cul-de-sac), and the abdomen closed. The hole in the vagina is afterwards closed with the patient in the lithotomy position. One must then hope that the forceps or other instruments that caused the injuries were sterile before use, and that the contents of the uterus were aseptic.

If, however, the injury be caused by an abortionist the outlook is not so hopeful, for the chances are greatly in favour of sepsis supervening; indeed these cases are rarely seen until this has already occurred and serious toxaemic symptoms are present. In these circumstances the abdomen should always be opened, and intestinal injuries sought for. A large gauze drain should then be carried into the vagina from the pelvis through the laceration, and the pelvis also drained through the abdominal wall—laterally on each side of the recti—and the patient put back into bed in the semi-sitting (Fowler) position (see p. 430), constant saline infusions being immediately resorted to (see p. 435).

INJURIES TO THE UTERUS.—While the uterus may be damaged, especially when pregnant, by the ordinary instruments of violence such as the knife or the bullet, or by the horn of a bull or the spike of an area railing in a leap from a window, it is unnecessary for us to go into the details here of such rare occurrences. These must be dealt with on ordinary surgical lines, and in most cases in which the uterus is pregnant these procedures will involve the removal of that organ.

In discussing the commoner injuries to the uterus it is necessary to divide our subject into

(1) Injuries to the cervix alone.

(2) Injuries to the body of the uterus, alone or together with injury to the cervix.

LACERATIONS OF THE CERVIX. (a) Lacerations due to parturition.—In many cases of so-called normal labour there are lacerations of the cervix. These are not always avoidable in the strict sense of the term, for they may occur in precipitate labour; at the same time the unskilful or premature use of forceps applied to the head which has not escaped from the cervix is a fruitful cause of laceration of the latter. Premature rupture of the membranes, which form the best dilating agent, likewise predisposes to cervical tears. As a rule the rent is situated on the left side, and this may have some relationship to the commonest position (L.O.A.) of the foetus. Next to this in order of frequency is the bilateral laceration, and lastly multiple or stellate lacerations.

PLATE I.

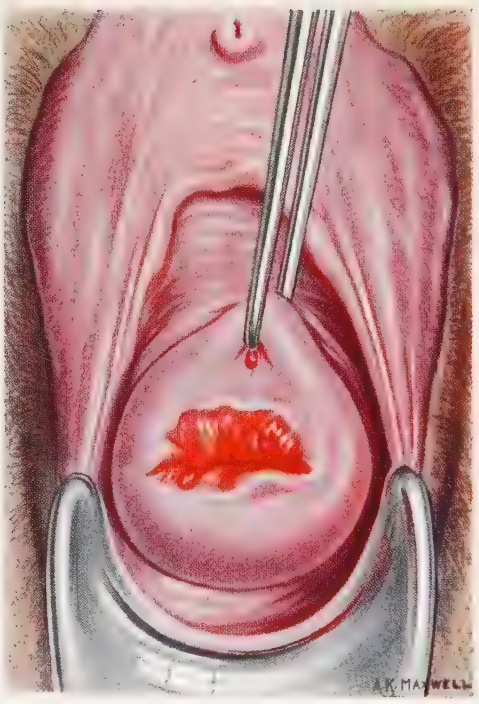

Fig. 116. Laceration of the cervix, showing eversion of the cervical mucosa.

[*To face p. 139.*

the vagina the deep grooves or grooves in the

With a vaginal speculum the lacera-

standing cases if the injury be extensive, and

be bilateral or multiple, the mucous membrane

everted, and present a deep red and furrowed

; the '*arbor vitæ*' of the mucous membrane

Frequently the whole cervix is enlarged

numerous ovula Nabothii; in such

inition or chronic cervicitis exists (see p. 246).

The **symptoms**, which may also help in the diagnosis, very very

importance. Again it is not uncommon to see neurotic women with all sorts of aches and pains, the origin of which has been ascribed to a lacerated cervix. It is important, therefore, fully to understand what may possibly happen as the result of a laceration of the cervix at parturition. In the first place the open wound may become infected and this may lead to *cellulitis* (parametritis) or even to general *septicæmia* or *pyæmia* conditions which produce a definite train of symptoms (see p. 207). If the patient escape from these infective consequences we may observe that *menstruation* is present, but whether this be coincidental with or a consequence of the injury may be difficult to determine. But probably the symptom most frequently complained of in chronic cases is *leucorrhœa*, which may cause much inconvenience and even be associated with *sterility*. There is no doubt, too, that leucorrhœa is a condition which is very debilitating to the patient. The *reflex nervous symptoms* ascribed by some authors to this condition are too vague to warrant much consideration apart from the general health of the patient. Finally, and perhaps most important of all, there seems to be little doubt that an unrepaired laceration is a powerful predisposing factor in regard to cancer of the cervix, although we are hardly justified in considering cancer to be a direct result of the laceration.

Treatment.—This is entirely operative when a cure is to be effected. It is to be recommended that if a bad tear be discovered after delivery it should be sutured immediately or on the next day, as advised in the case of other lacerations. If the case come under notice later the treatment resolves itself into a plastic or radical operation on the cervix. When the lacerations are many, and the cervix is enlarged and diseased, amputation should undoubtedly be performed (see p. 497). When there is merely a bilateral or unilateral laceration without much enlargement of the cervix, simple repair such as is described on

Lacerated os of the cervix, showing eversion of the cervix.

To face p. 130.

The **diagnosis** is a simple matter, but is not often made immediately after parturition, when the fresh raw tear can be seen and felt. To the examining finger in the vagina the deep groove or grooves in the cervix are easily discernible. With a vaginal speculum the laceration is seen. In old standing cases if the injury be extensive, and especially if the tears be bilateral or multiple, the mucous membrane of the cervix may be everted, and present a deep red and furrowed appearance (fig. 116); the '*arbor vitae*' of the mucous membrane may also be clearly visible. Frequently the whole cervix is enlarged and bluish in colour, with, perhaps, numerous ovula Nabothii; in such cases a condition of chronic cervicitis exists (see p. 246).

The **symptoms**, which may also help in the diagnosis, vary very considerably in degree. Some patients present no symptoms of any importance. Again it is not uncommon to see neurotic women with all sorts of aches and pains, the origin of which has been ascribed to a lacerated cervix. It is important, therefore, fully to understand what may possibly happen as the result of a laceration of the cervix at parturition. In the first place the open wound may become infected and this may lead to *cellulitis* (parametritis) or even to general *septicaemia* or *pyaemia*, conditions which produce a definite train of symptoms (see p. 267). If the patient escape from these infective consequences we may observe that *subinvolution* is present, but whether this be coincidental with or a consequence of the injury may be difficult to determine. But probably the symptom most frequently complained of in chronic cases is *leucorrhoea*, which may cause much inconvenience and even be associated with *sterility*. There is no doubt, too, that leucorrhoea is a condition which is very debilitating to the patient. The *reflex nervous symptoms* ascribed by some authors to this condition are too vague to warrant much consideration apart from the general health of the patient. Finally, and perhaps most important of all, there seems to be little doubt that an unrepaired laceration is a powerful predisposing factor in regard to cancer of the cervix, although we are hardly justified in considering cancer to be a direct result of the laceration.

Treatment.—This is entirely operative when a cure is to be effected. It is to be recommended that if a bad tear be discovered after delivery it should be sutured immediately or on the next day, as advised in the case of other lacerations. If the case come under notice later the treatment resolves itself into a plastic or radical operation on the cervix. When the lacerations are many, and the cervix is enlarged and diseased, amputation should undoubtedly be performed (see p. 497). When there is merely a bilateral or unilateral laceration without much enlargement of the cervix, simple repair such as is described on

page 494 may be carried out. The results of operation are very good, whether amputation or repair be practised, so far as the local condition is concerned; but when these procedures are practised to relieve obscure nervous symptoms the benefit derived by the patient often depends to a great extent on the capacity of the operator to view his results in an impartial manner.

(b) **Lacerations due to operative procedures.**—During the rapid dilatation of the virgin or even of the pregnant cervix lacerations frequently occur, but are as a rule of no moment, and probably always heal under aseptic conditions. If these be not maintained and sepsis follow, infective cellulitis with all its attendant train of symptoms may result.

INJURIES TO THE BODY OF THE UTERUS.—The injuries commonly met with are:

(*a*) Those produced by the operator or abortionist, or by foreign bodies.

(*b*) Spontaneous rupture of the uterus.

It is not proposed to discuss injuries in which some lacerating instrument penetrates the uterus after perforating the abdominal wall, for such injuries usually fall under the care of the general surgeon.

(a) **Injuries produced by operative procedures.**—An instrument such as a sound, curette or dilator may perforate the uterine wall. This is an accident that happens to skilled and careful operators at times, but as a rule no harm results because the operation has been conducted aseptically, and because the operator has been aware of what has happened, and has not made matters worse by curetting the contents of the abdomen. If the uterus happen to be septic serious results may follow. Many lives have been lost from the septic peritonitis which has followed the perforation of the uterus by abortionists.

The recognition of perforation of the uterus is not difficult. When a flushing curette is being used it will be noticed that the water does not return, and on the passage of a sound the point can be felt under the abdominal wall; it will be noted, in fact, that the instrument passes an abnormally long way in proportion to the size of the uterus. It has been recorded on several occasions that when a practitioner was curetting a uterus, or emptying it of a partial abortion, he was surprised to find himself delivering bowel! This is a very grave accident, and that it has happened more than once or twice should make practitioners very careful when performing intrauterine operations. The pregnant, or recently pregnant organ is very friable, and it is not generally realized how easy it is to perforate the wall. It is

impossible to attempt to say how this should not be done, as it is largely a matter of skill and sense of touch. One useful hint, however, may be given, and that is that the fundus of the uterus should be grasped with the left hand through the abdominal wall, which is covered with a sterile towel. If this be done the intrauterine manipulations are to some extent estimated by the hand on the abdomen, and there is therefore less risk of perforation. The safest plan for those who are not practised in gynaecological surgery is to use nothing except the finger inside the uterus which is being emptied of the products of conception.

The **treatment of instrumental perforation** depends entirely on the question of asepsis. If the uterus were not in a pregnant or recently pregnant condition, and if the operation have been conducted aseptically, it is not necessary to do more than to drain the uterus for two or three days with a gauze wick. There will probably be no symptoms. Should abdominal symptoms arise it may be necessary to perform laparotomy and establish drainage of the pelvis. If the contents of the uterus be septic—the results of abortion or cancer of the body—removal of the uterus must be carried out at the earliest moment. This operation should, if possible, be performed *per vaginam* in order to limit the infection.

In those grave cases in which, when the patient is first seen, septic peritonitis is already present as the result of the unskilled efforts of the abortionist, the abdomen must be opened, and the lacerated uterus removed, if the patient be in a fit condition to stand such a procedure.

When intestine is delivered through the laceration in the uterus (ovum forceps are generally responsible for this) laparotomy must be performed, and the injured gut excised if this should prove to be advisable. The laceration in the uterus can then be closed with sutures if the organ be not septic. When the uterus has been perforated or injured by a foreign body which the patient or some malign person may have introduced, or by an intrauterine stem, the treatment should follow on the lines already indicated, and be governed largely by the question of possible sepsis.

(b) **Spontaneous rupture of the uterus.**—Under this heading we must consider ruptures of the uterus during pregnancy, and though we have called these accidents spontaneous we must include one class of case which is not entirely so. Further it is to be remembered that disease of the uterus, whether it be due to growths or to degeneration of the muscle fibres, predisposes to rupture.

Rupture of the pregnant uterus, then, may occur:

(1) As the result of violent contractions which produce little, or no effect on the progress of labour. This accident may happen when there is some definite obstruction to the passage of the child, either

from the large size of the head, the small size of the pelvis, or from an obstructing growth.

(2) As the result of a fall during pregnancy. This is very rare. The rupture of the uterus is brought about by *contre-coup*.

(3) As the result of intrauterine manipulations, such as 'turning' when the amniotic fluid has escaped and the uterine wall has retracted and is gripping the foetus. Such a procedure is rarely justifiable.

Ruptures of the uterus during parturition are not at all uncommon, especially after intrauterine manipulations. Spontaneous ruptures, and those produced by the obstetrician, are complete or incomplete according to whether the whole thickness of the uterine wall with the peritoneum be involved in the laceration, or there be a laceration which does not extend so deeply. The tear generally occurs low down at one or other side of the uterus, usually on the left, and often involves the whole thickness of the wall and extends through the cervix into the vault of the vagina, and for several inches up the side of the uterus (fig. 117). Sometimes these tears extend into the broad ligament.

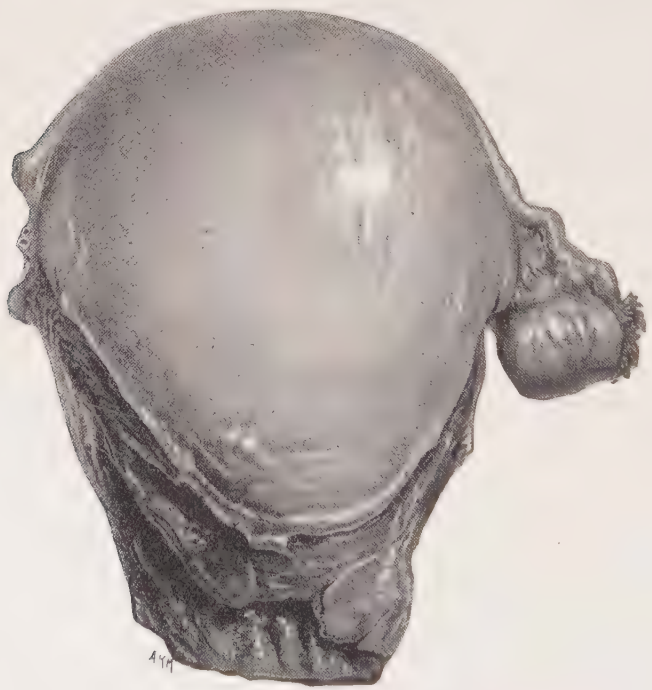

Fig. 117.—Laceration of the uterus. Note the tear, extending up the left side of the cervix into the broad ligament.

In some cases the uterine artery is torn through. Occasionally the laceration of the uterus is at the fundus.

When the injury is produced by *contre-coup* the rent may occur anywhere, the site depending upon the direction of impact.

The **symptoms** of rupture of the uterus are generally marked. The patient complains of pain, sometimes a feeling of something having 'gone'; there is generally profuse bleeding with collapse. Usually the obstetrician feels with his hand the deep laceration; at other times bowel descends through the rent, an occurrence that, of course, at once settles the question of diagnosis.

Treatment.—In an emergency, until proper surgical procedures can be carried out, the laceration should be plugged with a *roll* of gauze (not a *strip*), and, if the patient be undelivered, a hypodermic injection of morphine administered, and no further attempt at delivery made. If the patient should have been delivered, an intramuscular injection of ergotin or infundibular extract[1] should be given. In either case the abdomen must be opened *at the earliest possible moment.*

If the patient should have been delivered after manipulations, the uterus must be removed, for there is considerable danger in leaving a ruptured and possibly infected uterus; besides, it is sometimes the only satisfactory way of arresting haemorrhage.

If the rupture be spontaneous, or the result of *contre-coup*, the laceration may be situated in the upper half of the uterus. In these circumstances the foetus may escape through the rent, and be found in the abdominal cavity; but if still in the uterus the child should be delivered by enlarging the laceration in the wall, the placenta and membranes removed, drainage through the cervix ensured, the wound in the uterine wall sutured, and the abdomen closed with or without drainage.

It is probably always advisable to remove the uterus when the laceration involves the cervix, even when the rupture is spontaneous.

The immediate after-treatment of these cases will be directed towards resuscitation of the patient from her condition of shock (see p. 426).

SLOUGHING OF THE VAGINA AND UTERUS. FISTULAE.—Apart from lacerations, injuries are sometimes caused to the vagina, which result in sloughing of the parts concerned. This may be caused by pessaries which have been worn for years without being changed, and by the use of caustics or other chemical irritants. On rare

[1] *Infundibular (pituitary) extract* which will be referred to occasionally was recently introduced by the author for the treatment of *shock*, *uterine inertia* and *postoperative intestinal paresis*. The introduction followed a series of physiological experiments carried out by Hick and himself. The effect on the blood pressure was discovered, along with that of adrenalin, some years ago by Schafer and Oliver. The extract is prepared for intramuscular injection by Messrs. Burroughs, Wellcome & Co.

occasions casts of the vagina have been passed (figs. 118 and 119). Such cases are generally very difficult to treat, as the injury is extensive. If there be no fistula, but merely a foul sloughing surface,

Fig. 118.—Cast of the vaginal epithelium caused by the use of strong chemicals in the vagina.

by careful douching and packing, the patient will do well in most cases, but death from septic infection is not unknown.

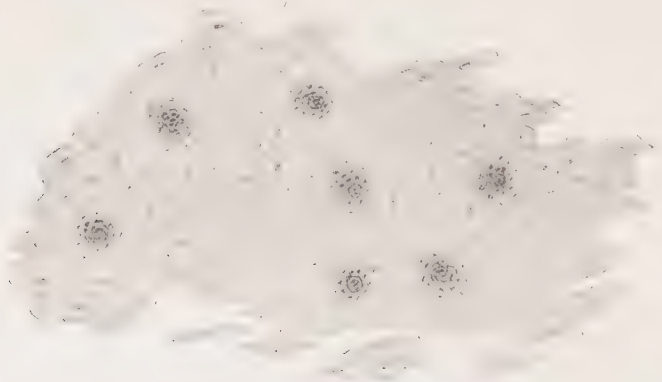

Fig. 119.—Cast of vaginal epithelium, showing histological appearance: squamous epithelium with the tips of the underlying papillae. (*Winter and Ruge, 'Gynäkologische Diagnostik.'*)

Again, sloughing of the vagina, cervix and lower segment of the uterus may occur when there is prolonged and great pressure exerted by the foetal head during parturition. In these circumstances so much bruising occurs that the vitality of the part is destroyed. The patient generally passes through the puerperium in a somewhat stormy manner, and much to the medical attendant's anxiety. Exhausted by the prolonged and difficult labour she spends the first few days rallying; but when she seems about to make up lost ground the temperature begins to rise, and the discharge becomes offensive. This goes on till eventually sloughs separate if the damaged area be of any size, and urine or faeces escape from the vagina. The patient has a fistula.

Fistulae.—There is a variety of fistulae, named according to the situation. They are *vesico-vaginal*, *urethro-vaginal*, *uretero-vaginal*, *recto-vaginal*, *utero-vesical* and *utero-intestinal*. The commonest of these are clearly shown in diagrammatic form in figure 120. Usually the

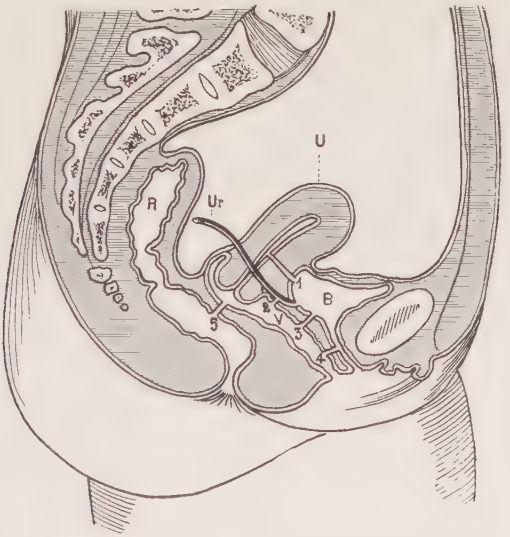

Fig. 120.—Diagram to illustrate the common forms of fistulae found in connexion with the genital passages.

U. Uterus. *B.* Bladder. *Ur.* Ureter. *V.* Vagina. *R.* Rectum.
1. Utero-vesical fistula. 2. Uretero-vaginal fistula. 3. Vesico-vaginal fistula. 4. Urethro-vaginal fistula. 5. Recto-vaginal fistula.

symptoms are too obvious to need description. When, however, the fistulous tract is between the bladder and uterus nothing of the opening can be seen *per vaginam*. It may be discovered owing to the fact that the menses are voided in the urine, or that urine escapes from the uterus. In any suspected case it is possible on filling the bladder with a weak creolin solution to see it flowing from the cervix, and with the cystoscope to detect the orifice of the fistula in the bladder.

Uretero-vaginal fistulae generally result from injury to the ureters during operative procedures, such as hysterectomy and the removal of ureteral calculi. The greatest skill is required to effect a cure in bad cases of fistula; but it is impossible to give a detailed account of all the various methods that have been devised to meet the requirements of exceptional cases. The general principles of the repair of vesico-vaginal and recto-vaginal fistulae are set out on pages 488 to 491. It may be mentioned, however, that when the fistulous tract lies between the bladder and the uterus it is necessary to separate the bladder from the anterior surface of the uterus, either by the vaginal (preferably) or the abdominal route, and close the respective openings.

Before attempting the cure of a fistula, the result of difficult labour, it is advisable to allow some time to elapse—say three months—in order to see how far the natural processes of repair will assist in the closure.

Fistulae resulting from malignant disease will be alluded to under the section dealing with that condition (p. 369).

§ iii. INJURIES TO THE FALLOPIAN TUBES AND OVARIES.

Apart from purely pathological processes, injuries of the tubes and ovaries are only found in connexion with perforating wounds of the abdominal cavity or fractures of the pelvis.

In perforating wounds there might be haemorrhage from injury to the blood vessels supplying the ovary or tube; but beyond this the chief symptoms would be due to the damage done to the other contents of the abdomen, and to the laceration of the abdominal wall.

So, too, in injuries due to crushing, any possible injury to the tubes and ovaries would be overshadowed by the much more serious general lesions.

CHAPTER VII.

ACQUIRED DERANGEMENTS OF THE NORMAL ANATOMICAL CONDITIONS: DISPLACEMENTS.

§ i. DISPLACEMENTS OF THE OVARIES AND FALLOPIAN TUBES.

These consist of herniae, prolapses, and other minor displacements from the normal site.

ACQUIRED HERNIAE are fairly common, and the ovaries and tubes have been found in the sacs of inguinal, femoral, ventral and obturator herniae, as the result of intraabdominal strain, but the congenital predisposition already described may form a more important factor than a consideration of the case seems to warrant, for there are surgeons who assert that all hernial sacs, except the postoperative forms, are essentially congenital.

Treatment consists of the removal of the hernial sac, with or without removal of the contained organs according to their condition.

PROLAPSES of the ovaries and tubes are generally associated, but it is the position of the ovary which gives rise to the troublesome symptoms that are frequently seen.

There are all degrees of prolapse. The ovary may be merely palpable *per vaginam*, hanging down at the back of the broad ligament, or it may lie, alone or with its fellow of the other side, at the bottom of Douglas' pouch. It is usual to find some degree of retroflexion or retroversion of the uterus at the same time. This condition most frequently follows pregnancy, but it is occasionally found in young unmarried girls. At times there is some pathological condition of the tubes such as ectopic gestation, or salpingitis; sometimes a small cyst or growth of the ovary may be the cause of the prolapse. The ovary and tube may be free and movable, or fixed by inflammatory adhesions.

Symptoms and physical signs.—Symptoms may be absent or very marked. If there be inflammatory disease of the tube many of the symptoms are those associated with that disease. Simple prolapse of the tubes causes no symptoms *per se*, but prolapse of an otherwise healthy ovary often gives rise to very distressing symptoms. If the woman be married there may be dyspareunia of an unbearable character. In all cases there is a dull, aching sacral pain, and often pain on defaecation, or when the colon is overloaded. Ultimately there may be symptoms of nervous irritability and hysteria.

It is not too much to say that in every case of obscure nervous irritability a pelvic examination should be made to find out whether the ovaries be in the normal position or not.

On bimanual palpation one can feel the ovaries, when prolapsed, as sensitive, mobile bodies lying low in Douglas' pouch usually rather to one side or the other. They must be carefully distinguished from faecal masses in the bowel, which are insensitive to the touch and 'pit' if firmly pressed against the pelvic wall.

Treatment.—Palliative measures are as a rule useless. Aperients and hot douching will give some relief if the ovaries be very tender and congested, but in all cases where there are definite and marked symptoms which can be ascribed to the pathological position of the ovaries an operation with the object of replacing the prolapsed organs should be advised.

OTHER DISPLACEMENTS OF THE OVARIES AND TUBES from the normal position are often dependent upon lesions of the neighbouring organs. Thus in inversion of the uterus the tubes and ovaries may be drawn into the cup-like depression so formed; and in prolapse of the uterus the ovaries and tubes are dragged down in the general descent of the parts. Again in retroversion of the uterus the ovaries and tubes may be found in front of that organ. These displacements, however, are of secondary importance, and their treatment depends upon the means adopted to rectify the primary causal factor.

§ ii. DISPLACEMENTS, VERSIONS AND FLEXIONS OF THE UTERUS.

Strictly speaking we talk of a uterine displacement when the organ is removed in its entirety from the normal situation, of versions or deviations when the normal direction is departed from, and of flexions or contortions when the shape is altered. These derangements may be forward, backward, upward, downward, or lateral in direction, or the organ may be inverted or herniated.

The uterus may be displaced from the normal position without any departure from the normal shape or direction, or it may be flexed alone, or with entire displacement of the organ.

It is necessary that these variations should be definitely understood and recognized, otherwise the diagnosis of the condition will not be easy. The terms 'displacement,' 'version' and 'flexion,' which have just been explained, will be those used here.

FORWARD DISPLACEMENT, VERSION AND FLEXION.—These consist of anteflexion, anteversion separately or together, and anteponation, which is never a primary condition.

In figure 121 is seen a diagrammatic representation of the anterior departures from the normal, viewed from the side. The imaginary lines, drawn at right angles in an antero-posterior plane, intersect at a spot about the level of the internal os, around which the derangements known as 'versions' and 'flexions' occur.

Anteflexion and anteversion.—These may occur separately or be combined. The normal position of the uterus is one of slight anteversion and very slight anteflexion, with the cervix pointing backwards and downwards.

Slight divergences from the normal produce no symptoms and are of no importance.

Marked anteflexion may occur without anteversion, especially if the deformity be 'congenital,' as it is called.

'**Congenital**' **anteflexion** is not uncommon. On bimanual palpation the uterus is felt to be semicircular in shape, hard and small. The cervix may be pointing downwards or forwards, according to the position of the fundus. That is to say if there be anteversion as well as anteflexion, the cervix is pointing ~~downwards~~; if the case be one of anteflexion alone, the cervix may be pointing forwards (*cochleate uterus*) (fig. 121 E). In simple anteversion the cervix points backwards.

These details are mentioned in order that the beginner may not fall into error in regard to the different positions of the cervix; these positions are of themselves of no practical importance in regard to the question of diagnosis.

The etiology is obscure and the condition can only be attributed to errors of growth in the early life of the subject. It is questionable whether the condition is really congenital.

Histologically these uteri have more fibrous and less muscular tissue than is normal during active sexual life, and in this respect they resemble infantile uteri.

The **symptoms** of 'congenital' anteflexion may consist of primary amenorrhoea (infantile uterus) or dysmenorrhoea of the colicky type.

The **treatment** consists of dilating the cervix and curetting the uterus. Sometimes it is advisable to perform hysterotomy (see p. 502) before curetting. Pregnancy may entirely cure the deformity, and

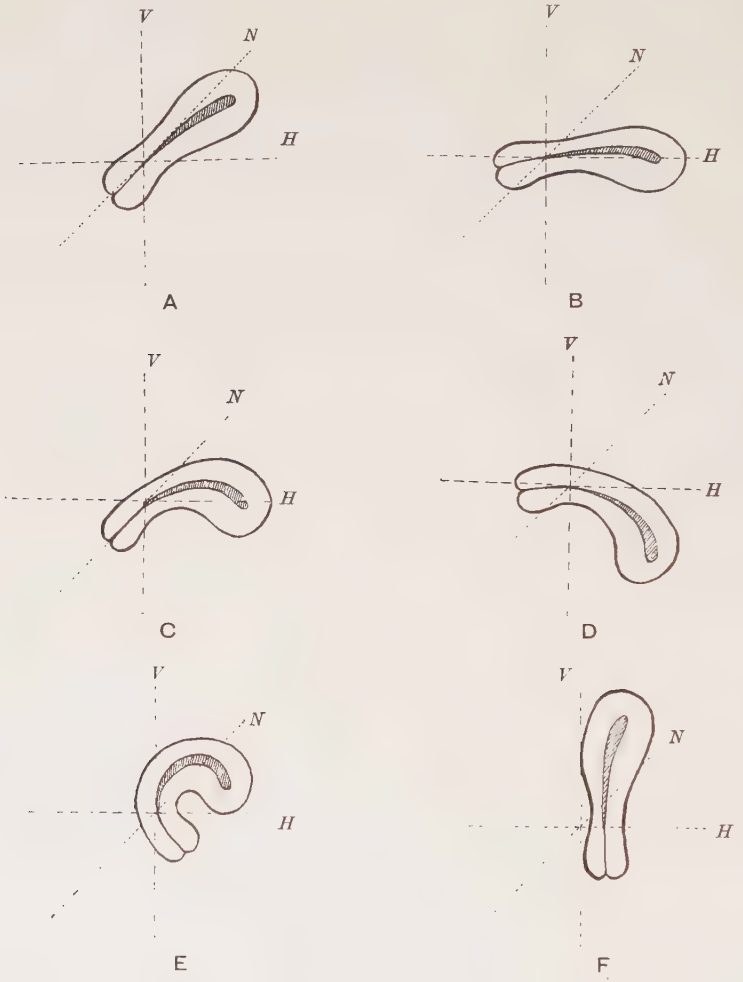

Fig. 121.—Diagram to illustrate anterior derangements of the uterus.

A. Normal position. B. Anteversion. C. Anteflexion.
D. Anteflexion and anteversion. E. Anteflexion (cochleate uterus).
F. Anteponation.

N. Normal direction of the uterus. *H*. Horizontal line through internal os uteri.
V. Vertical line.

the uterus may settle down after involution into a normal position. Unfortunately women with this uterine derangement are nearly always sterile.

Physiological anteflexion occurs during pregnancy. For this reason one of the early symptoms of pregnancy is frequency of micturition from the pressure of the enlarged fundus on the bladder.

Acquired anteflexion and anteversion are the result either of the increased weight of the organ which occurs in fibromyomatous and inflammatory disease (chronic metritis) of the uterus, or of the pressure of large tumours upon the posterior wall of the uterus, or of pelvic haematocele or abscess. It is stated that contraction of the utero-sacral ligaments following pelvic cellulitis produces anteversion. This, if it be a cause at all, must be very rare.

The differential **diagnosis** in regard to anteflexion and anteversion as a rule is not difficult. But since most of the cases producing symptoms occur in young unmarried women an anaesthetic may be required in order to make a proper examination.

A fibromyoma in the anterior wall, or on the front aspect of the fundus, is the most frequent source of error. With the patient under an anaesthetic the tumour can be felt to be in front of the fundus which may itself be retroflexed (fig. 122). This diagnosis can be confirmed, if necessary, by passing a uterine sound, by means of which the direction of the uterine cavity can easily be discovered.

Fig. 122. — Retroflexed uterus with fibromyomatous growth on the anterior wall.

Inflammatory exudations in the cellular tissue between the bladder and uterus are commonly supposed to offer a difficulty by resembling the fundus of the uterus. There is, however, not much difficulty as a rule, for cellulitis is rarely so limited and is nearly always to be found in the broad ligaments as well. There are, too, the usual signs and history of an attack of inflammatory disease in the pelvis.

Tumours of the base of the bladder by their close connexion with the anterior surface of the supravaginal cervix may cause some difficulty in diagnosis, but as a rule it is easy to find the fundus uteri above the tumour on bimanual palpation; if this be not possible, the sound will always reveal the direction of the uterine cavity. In cases of bladder tumour there are marked urinary symptoms, often haematuria. Tumours between the bladder and uterus—that is, in the utero-vesical pouch—are generally dermoids of the ovary, but the diagnosis is not always clear. Dermoids of the ovary are usually movable and independent of the uterus.

The **treatment** of pathological anteversion or flexion depends upon the treatment of the allied conditions. Pessaries are of little use, even if they can be considered advisable.

Anteponation, or displacement of the uterus forwards, is produced by tumours of the ovary, growths from the posterior wall of the uterus, pelvic haematocele, inflammatory affections of the tubes and ovaries and retroperitoneal tumours filling the posterior part of the pelvis and pushing the whole uterus forwards.

BACKWARD DISPLACEMENT, VERSION AND FLEXION.—These derangements which are diagrammatically represented in figure 123 are the reverse of the anterior.

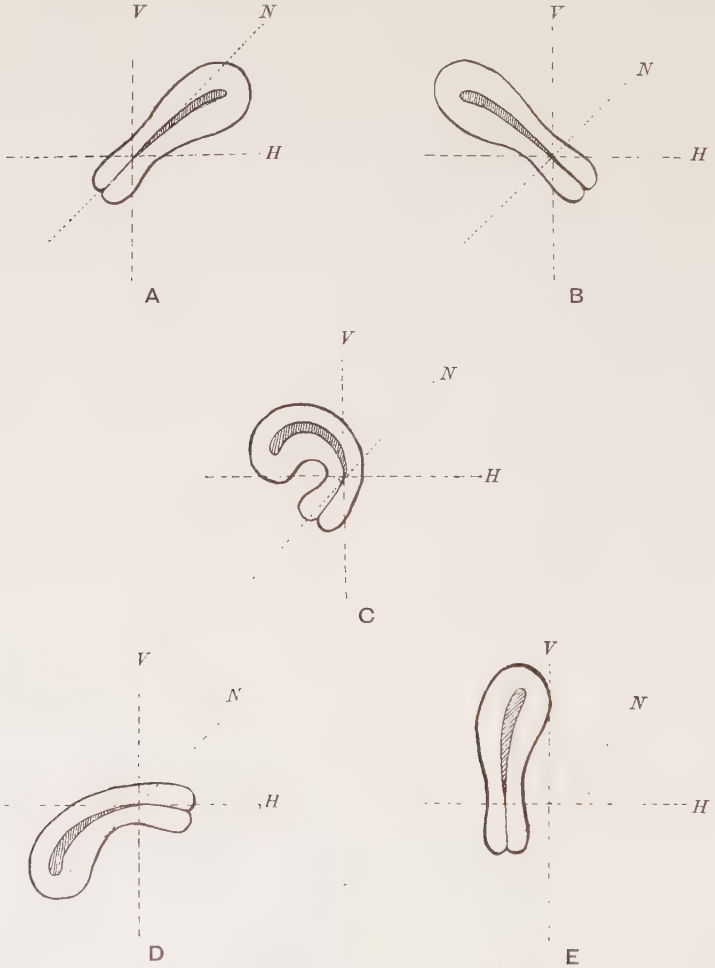

Fig. 123.—Diagram to illustrate posterior derangements of the uterus.

A. Normal position. B. Retroversion. C. Retroflexion.
D. Retroflexion and retroversion. E. Retroponation.

N. Normal direction. *H*. Horizontal line through internal os uteri. *V*. Vertical line.

Retroversions and retroflexions, like the anterior derangements, may occur together or independently. The position of the cervix varies according to whether there be retroversion or not. That is to say, a retroflexion of the uterus may exist with the cervix pointing in the normal direction—downwards and backwards; but if there be retroversion the cervix will be pointing forwards or directly downwards.

Bimanual palpation reveals the fact that there is no fundus between the first finger in the anterior vaginal cul-de-sac and the hand on the abdomen; and by pressing deeply with the hand on the abdominal wall the fundus will be felt between it and the middle finger, situated in the posterior cul-de-sac (fig. 100, p. 112).

In order to understand retroflexions and retroversions of the uterus it will be advisable to describe them on an etiological basis, and consider the varieties separately.

'Congenital'[1] retroversion.—It is extremely common to find in young girls a condition of retroversion usually moderate in degree, and there is very little doubt that there are no symptoms dependent upon it. Even if there be dysmenorrhoea it is rarely due to the position of the uterus, nor is the pain relieved by keeping the uterus forwards either by operation or with a pessary. This condition is best left alone, and the patient ought not to be informed of the state of affairs. Should she marry and become pregnant, the uterus will probably assume the normal position; if it do not, and tend to become retroflexed, an Albert Smith (fig. 124) or Hodge pessary (fig. 125) should be inserted until the fourth month, and any subsequent displacement, if such should exist, treated on the lines to be laid down presently.

'Congenital'[1] retroflexion.—This is quite a rare condition: much rarer than anteflexion. The deformity is a fixed one, and, although the whole uterus is mobile, it cannot be reduced. In many of these cases there are no symptoms, and in such cases no treatment is required. If, however, there be severe dysmenorrhoea the best, in fact the only, method of treatment available is dilatation of the cervix. This should be done very gradually with metal dilators (see p. 499). Considerable relief usually follows. An absolute cure of the retroflexion, however, can hardly be expected unless the patient become pregnant.

Often no symptoms are complained of until the patient marries, when she may be sterile or, if she become pregnant, she may have an abortion or series of abortions due to the malposition. In these cases, if the degree of retroflexion be slight, the uterus should be carefully cleaned out *immediately after the abortion* and packed with

[1] The above types are spoken of as 'congenital,' but it is doubtful if they be really of congenital origin; it is more probable that the deformity arises during growth.

gauze, while still in the softened condition due to pregnancy, and the fundus kept forwards with an Albert Smith pessary. If the

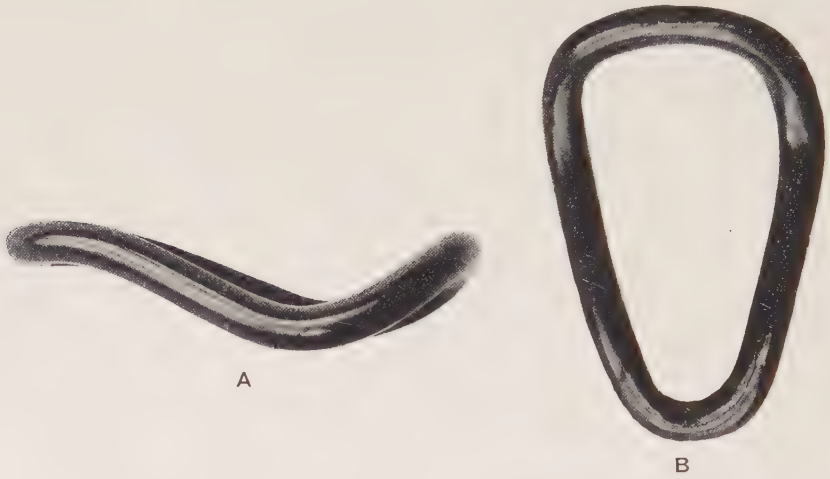

Fig. 124.—Albert Smith pessary.

A. Side view to show the pelvic curves. The wider upper end is to the right.
B. Front view showing the broad upper and narrow lower ends.

retroflexion be difficult to control by these means, and the fundus of the uterus tends to sit on top of the pessary, or if the displacement recur after the pessary has been taken out in a few months' time, one of the more radical operations should be undertaken. (See p. 162.)

Fig. 125.—Hodge pessary.

The upper end is more rounded than the lower, and the sides are parallel. The pelvic curves (seen in a side view) are the same as in the Albert Smith pessary.

Puerperal retroversion and retroflexion.—Into this division falls a very large majority of the cases which call for treatment; consequently it may not be out of place to consider first of all what may be done in the way of prophylaxis. It is necessary to remember that if a woman get over her first parturition well, and without any subsequent backward displacement, it is exceedingly rare for such to occur after any future pregnancy. Of course if a tendency to displacement, taken in time perhaps, be found after a first pregnancy the same condition may follow any subsequent pregnancy. However, if the woman without assistance remain well

after the birth of her first child there is little fear for the future. In view of this it is incumbent upon every medical practitioner to examine his patient one month after confinement, for recognition of the pathological condition thus early leads to an easy and speedy non-operative cure. According to some modern authorities allowing the patient out of bed early (third day) after parturition is a prophylactic measure of great importance. Further evidence, however, is needed before such a course can be adopted as a routine practice.

In pregnancy while the whole uterus undergoes marked softening the lower segment, just above the cervix, is softened earlier and more markedly than the rest of the body; subsequent to labour this portion retains its softness longest. It is therefore very common to see a bending back of the fundus from the want of support afforded by this lower segment, which has failed to regain its tone. This falling back or retroflexion of the fundus is the first stage, retroversion of the whole uterus following later. One usually finds general subinvolution of the uterus as well. In the absence of fixation by inflammatory processes, which rarely occur, the deformity is easily reducible.

If the retroflexion be quite recent and the only symptom slight backache—without marked subinvolution and menorrhagia or metrostaxis, when curetting may also be necessary—it is usually sufficient to reduce the flexion, which is a simple matter, and to insert an Albert Smith pessary. This may be done at one sitting, and without an anaesthetic if there be no tenderness. If, however, the tenderness be marked an anaesthetic should be given, the deformity remedied by the recognized method of traction on the cervix (see p. 159) and glycerine tampons, with a light gauze pack, placed in the vagina. After a few days' rest in bed with local treatment by hot douches and glycerine tampons, the patient will usually tolerate the insertion of the pessary, with subsequent comfort. At the same time any subinvolution of the uterus or general enfeeblement of the patient's health should be suitably treated. These measures should effect a cure in a few months, when the uterus will have recovered its tone sufficiently to maintain the normal position unaided.

If the retroflexion and version be of long standing, without the likelihood of the muscle wall being able to recover and retain the fundus in the normal position—a state of affairs leading to interference with the venous circulation with oedema of the endometrium (fig. 126) and giving rise to menorrhagia—or if the measures, just mentioned, fail after a trial of six months; or if a large tender prolapsed ovary be found at the same time as the displacement is discovered; then an operation for supporting the uterus should be resorted to.

Pelvic inflammation associated with retroflexion and retroversion.—In this connexion it is necessary to point out that the pelvic inflammation may be subsequent to the uterine malposition or the actual cause of it; but it is unnecessary to say more than that the inflammatory process may arise from the uterus itself, from the appendages or from the large bowel (sigmoid, rectum and appendix vermiformis), for the treatment is the same in principle.

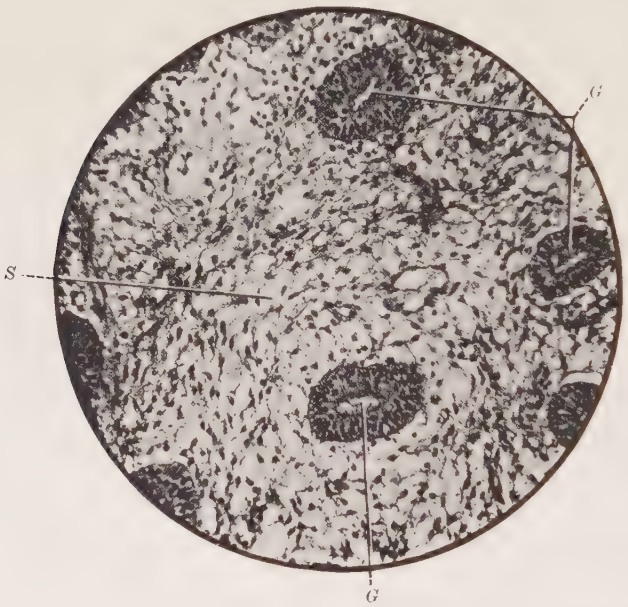

Fig. 126.—Oedematous endometrium from a case of retroflexion of the uterus with slight prolapse. ×300. (*Photomicrograph.*)

G. Glands. *S*. Oedematous stroma.

The symptoms may be, and generally are, chiefly those of the associated disease; but, as regards the uterus, backache, constant 'dragging' pain, menorrhagia or metrostaxis, dysmenorrhoea, sterility or repeated abortion may cause a train of symptoms demanding radical treatment. Pessaries are, of course, out of the question. The uterus is fixed by adhesions and often very tender, a state of affairs which a pessary will only aggravate. The abdomen must be opened, the adhesions broken down, diseased structures removed or appropriately dealt with, and the malposition remedied by one of the operations to be mentioned later. It is important, however, to bear in mind that this should never be done when the inflammatory process is in an acute stage, unless the exigencies of the case demand immediate laparotomy.

Retroversion as an early stage of prolapse.—Nearly every case of prolapse commences with retroversion of the uterus, and it is most important to recognize any degree of descent which may be present. There is no doubt that a retroversion of the uterus, with slight descent, can be effectually treated with an Albert Smith or Hodge pessary so long as the introitus is intact, and good support is afforded to the pessary by the outlet. There are, however, strong objections to pessaries, except as a temporary method of treatment when a cure is expected within a reasonable time; but when the retroversion is a stage or process in the descent of the uterus a cure is hardly to be expected, except, perhaps, in a few early detected puerperal cases. If the patient will not submit to the major operation she must have the pessary; but very often the perineum must be repaired before a pessary can be effectual, in which case she will usually be willing to have an abdominal operation performed as well; and this is the treatment that should be advised.

Retroversion caused by pelvic tumours or overdistended bladder.—In these circumstances it is usually sufficient to remove the cause to obtain restitution to the normal position. But if the displacement be due to a tumour and of long standing, and giving rise to symptoms (which it rarely does *per se*), it can be remedied, by one of the means to be described directly, at the same time as the tumour is removed.

Traumatic retroversion.—Retroversion without prolapse, assigned to a strain, occurs occasionally; but it must be very rare. No special description of the pathology is necessary, for it is merely a question of the deviation following intraabdominal strain. As regards treatment: if the symptoms warrant interference one of the radical measures may be necessary, but it is said that replacement of the uterus and the insertion of a Hodge pessary for a time will cure the condition. The cases generally occur in young unmarried women, and there is often reason to doubt the causal factor given.

It will be obvious from a consideration of the foregoing facts that the class of retroversion and retroflexion which gives rise to the most symptoms intrinsically is that which is placed under the heading of 'puerperal.' Fortunately this variety is the most amenable to simple treatment if taken in time. On the other hand, it must be clear that while those cases of retroflexion and retroversion in which there are adhesions are for the most part cured by operation, the result is often due to the removal of concurrent disease; and lastly, it will have been gathered from an analysis of the statements made, that the most unsatisfactory cases are simple retroversions in unmarried women, who

are often neurotic from the unfulfilled functions of their sex, and who are not really suffering from the displacement at all. To attract the attention of these women to their already hypersensitive organs is a serious mistake, and one which will never bring *kudos* to the over-zealous practitioner.

The differential **diagnosis** in backward, as in forward, derangements is mainly concerned in distinguishing the fundus uteri from other 'lumps.'

The pathological conditions which produce swellings that are most commonly mistaken for the fundus of a retroverted uterus are fibro-myomata of the posterior wall of the uterus, pyosalpinges, small ovarian tumours and tubal pregnancy. The result of a careful physical examination, taken in conjunction with the history, is usually sufficient to enable the practitioner to make a correct diagnosis.

Ovarian tumours, such as small adherent cysts, may also be mistaken for a retroverted gravid uterus, and, indeed, a history of amenorrhoea may contribute to the wrong diagnosis. If the ovarian tumour be movable apart from the uterus it is hardly possible to make a mistake.

Unless pregnancy be suspected the sound may be used to clear up any doubt, but the practitioner should never allow himself to make a diagnosis with the sound until he has exhausted every other means. If he do, sooner or later he will pass the instrument into a pregnant uterus, an action which he may have considerable cause to regret. Efficient bimanual palpation with a careful consideration of the history will lead to a correct diagnosis in most cases.

Replacement of a retroflexed or **retroverted uterus.**—When the uterus is in a suitable condition (*vide supra*) it must be replaced in the normal position. This, of course, cannot be accomplished if the case be one of 'congenital' retroflexion, nor if the uterus be fixed by adhesions. Consequently it is chiefly with puerperal flexions and versions that we are concerned.

In many cases it is an easy matter to replace the fundus in the normal position with the fingers alone, by vagino-abdominal or vagino-recto-abdominal manipulations with the patient in the Sims' or genu-facial position. In some cases this is impossible, and the use of instruments is necessary. Before attempting instrumental replacement the practitioner should make sure that the bowels have been thoroughly evacuated, and the bladder emptied.

The original method of instrumental replacement was by means of the sound. This method will not be described as it is not without danger; for as already indicated the sound is an instrument which should rarely be used. The proper method for reducing backward

derangements is that known as the 'traction method.' This can be done with the patient in the left lateral, or in particularly difficult cases in the genufacial position.

The method is the same in either case. A Sims' speculum is passed into the vagina and a good hold obtained of the anterior lip of the cervix with a volsellum. The gloved index finger of the left hand is then inserted into the rectum, and while traction is made on the cervix with the volsellum the finger in the rectum guides the fundus forwards. The drawing down of the uterus enables the fundus to pass the promontory of the sacrum.

As soon as the fundus has been thus projected forwards, still keeping the finger in the rectum exerting pressure on the posterior uterine wall, the surgeon pushes the volsellum sharply upwards and backwards towards the hollow of the sacrum. This manoeuvre throws the fundus completely forwards. Upward pressure is maintained on the cervix for a few minutes. The volsellum is then taken off and the pessary inserted. Sometimes, especially in simple retroversion, the replacement can be successfully accomplished by manoeuvring the volsellum without the assistance of a finger in the rectum.

Insertion of the Hodge and **Albert Smith pessaries.**—These pessaries are both made of vulcanite and can therefore easily be kept clean. They are very similar in shape (figs. 124 and 125), but the Albert Smith is wider at the top than at the vulval end, and the pelvic curvatures are somewhat more pronounced than in the Hodge pessary. The Albert Smith pessary is the better to use in women who have had children and whose vaginae are capacious. The Hodge pessary has parallel sides and the top end is round, whereas the vulval end is straight. This pessary should be used in unmarried women and in those who have narrow vaginae. It must be borne in mind that these pessaries are only for temporary use in curable cases, or to find out if the symptoms complained of disappear after reposition of the uterus and the use of a pessary. Operation is advisable to cure retroflexions and retroversions if, when a pessary is worn, the symptoms are relieved without a cure being effected. Before inserting a pessary it is necessary to form some idea as to the size required, and no pessary must be worn that does not fit properly. The pessary should extend from the posterior cul-de-sac to the lower end of the anterior vaginal wall. One should just be able to insert the finger-tip between the end of the pessary and the symphysis pubis; and the anterior vaginal wall should not be stretched across the central aperture. If the latter occur it means that a narrower instrument must be used—possibly a Hodge instead of an Albert Smith pessary. Before the pessary is inserted it should be placed in boiling water for a minute or two. The upper end

is then well lubricated, and the pessary grasped in the right hand in the manner indicated in figure 127. Next, the labia are gently separated with the middle finger of the left hand and the pessary inserted in an antero-posterior plane (fig. 129). Care must be taken to press the side of the pessary against the perineum, and to avoid the sensitive vestibule. By thus pressing backwards and upwards the pessary will be passed into the vagina, when the upper end is directed into the posterior cul-de-sac by withdrawing the index finger and passing it in behind the lower bar in order to hook the upper bar behind the cervix (fig. 128). After insertion the pessary lies in the position indicated in figure 130.

Fig. 127.—Method of holding an Albert Smith (or Hodge) pessary during the insertion through the vulva and orifice of the vagina.

Before the patient leaves the couch she should be asked to strain in order to see if the pessary maintain its position. A woman rarely knows that she has one of these instruments in her vagina, even though she be wearing it for the first time, so little discomfort does a properly fitting pessary cause. She should be instructed to have the instrument removed for cleaning purposes at least once in every six weeks, and to be careful to douche with hot normal saline solution daily. Whenever possible saline solution should be used for douches instead of medicated solutions, in order that conception may not be interfered with.

Removal of a Hodge or **Albert Smith pessary.**—To accomplish this the forefinger of the right hand is inserted into the vagina and hooked over the lower bar, traction is then made backwards and downwards. The pessary is felt to rotate from the transverse to the antero-posterior plane as it reaches the orifice, and in this position it is withdrawn.

Fig. 128.—Method of forcing an Albert Smith (or Hodge) pessary into position, with the upper end behind the cervix, after it has been passed through the vaginal orifice.

Vaginal douching is employed for two purposes: to keep pessaries clean and to prevent irritation of the vagina of patients wearing them, and to treat certain pathological conditions, such as gonorrhoea, which will be mentioned later.

It is, therefore, important that the proper method of carrying out this simple procedure should be explained, since it is not always made clear to the patient or insisted upon.

Fig. 129.—Insertion of the Albert Smith or Hodge pessary. First stage: passing the pessary through the vulva.

Among the very poor, who cannot afford a proper apparatus, it may be necessary to be content with the ordinary method of administration by means of a rubber ball syringe and a vaginal tube. The latter should be of glass and be capable of being boiled. It is, however, better, when possible, that in these circumstances a district nurse with a proper apparatus should carry out the douching. This is, perhaps, the more important in those cases in which disease has to be treated rather than mere cleansing performed.

The necessary apparatus for efficient douching consists of a douche-

can holding at least one quart, six feet of rubber tubing to connect the douche-can with the vaginal tube, which is of glass with a 'rose' nozzle, and several more feet of tubing to connect the return tube with a vessel in which the returned fluid is to be collected. If a suitable

Fig. 130.—Diagram to show the position and mode of action of a Hodge or Albert Smith pessary after insertion.

piece of apparatus be used to hold the vaginal douche-tube and return tube in position the patient can administer the douche while lying comfortably on her back—and this is the correct position.

The best instruments are those made on the plan of the model seen in figure 131 A. Such an apparatus can be held tightly in the vaginal orifice while the fluid—under the control of a tap at the lower end of the delivery tube—flows into the vagina by the vaginal nozzle and out by the return tube into the waste pan. There is no mess, no discomfort, and no scalding of the vulva and thighs, consequently much hotter solutions can be used than is otherwise possible. The apparatus is shown *in situ* in figure 131.

For cleansing or for sedative purposes normal saline solution is the best; for the treatment of infective conditions antiseptic solutions should be employed. At least four quarts of fluid at a temperature of 112° F. to 115° F. should be used. The temperature can be regulated by having jugs containing the solution both very hot and cold. By mixing these in proper proportions in the douche-can it is easy to obtain the desired degree of heat, as indicated by a long thermometer in the contained fluid.

Operative procedures and the **choice of operation.**—As already

indicated, in many cases of retroversion and retroflexion an operation may be necessary. A considerable number of methods has been devised, and most operators have pinned their faith to one particular operation; and since there is a considerable divergence of

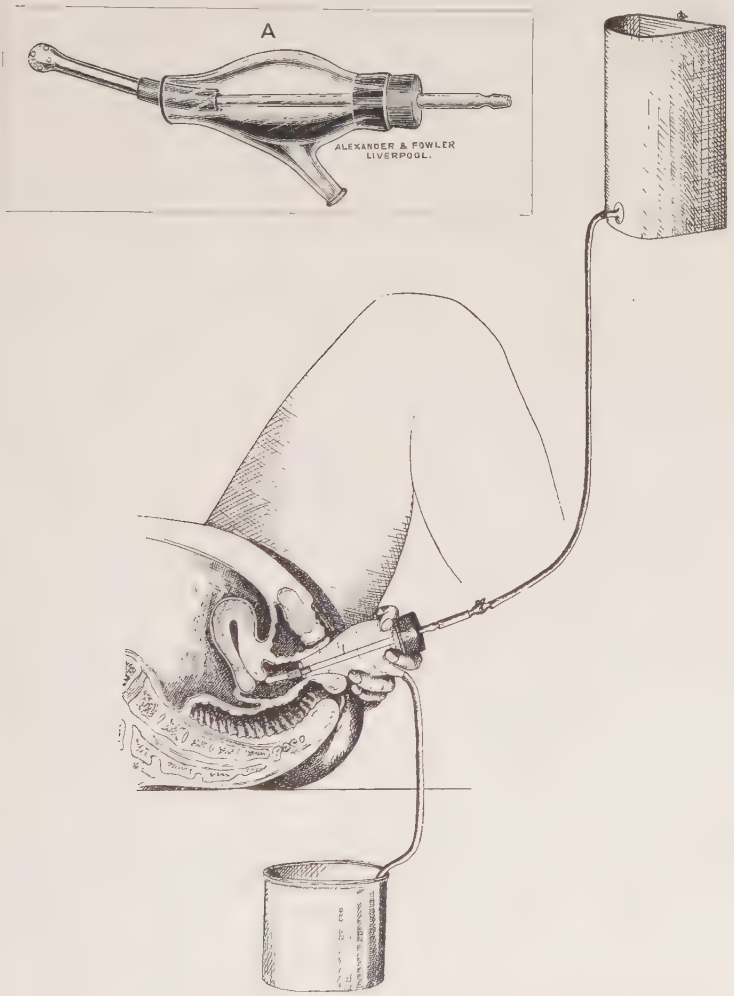

Fig. 131.—Sectional view of the pelvis with douche apparatus *in situ*, showing the method whereby the patient is able to douche herself while lying on her back. Inset in the left top corner is an illustration of the glass irrigation apparatus.

opinion it may be worth while, without going into details of technique, briefly to summarize the various procedures, and to indicate the value or otherwise of each. Those usually employed by others and those preferred by the author are described in detail in Chapter XVI.

Vaginal fixation (Mackenrodt), whereby the anterior vaginal wall is separated from the bladder, and the uterus is drawn down and sutured to the bladder surface of the vaginal canal. Dystocia (difficult labour) has been such a frequent sequel to this operation that it cannot safely be recommended.

Vaginal shortening of the utero-sacral ligaments has enjoyed some popularity in America, but it is not a good operation for several reasons. In the first place it is difficult to perform satisfactorily, and secondly it fails to relieve any flexion which may be present.

Alexander's operation (see p. 465), is only able to remedy a condition of simple mobile retroversion, such as is found in young women and is often symptomless. It is, therefore, an operation only to be recommended in very exceptional cases.

Ventrifixation (see p. 462).—Although this operation as a procedure for the rectification of backward derangements deserves to be dismissed in a few words, it is perhaps not justifiable to do so, since many well-known gynaecologists employ it largely and often solely. In this term is included any operation by which the uterus is attached to the anterior abdominal wall, whether by suspension by means of peritoneal adhesions to the anterior or posterior surface of the uterus, or by the actual fixation of the uterus to the aponeurosis.

The first of these procedures is apt to be unsatisfactory; for if peritoneal adhesions be made they may disappear. Even if the peritoneal adhesions persist they are liable to stretch and make bands which may lead, and often have led, to intestinal obstruction. To avoid this a complete septum from the uterus over the fundus of the bladder has been recommended; but, even with this modification, the operation remains unsatisfactory and unscientific, since it makes an artificial condition within the abdomen which may still, should any of the stitches fail to hold, lead to intestinal obstruction by the passage of a loop of intestine underneath the septum—between it and the bladder.

Furthermore, peritoneal adhesions, stretched by the enlarging uterus in pregnancy, remain stretched afterwards, and give no support when most required during involution.

Again if the uterus of a woman before the menopause be firmly fixed to the aponeurosis dystocia may occur, indeed many such cases have been reported, and even rupture of the uterus in parturition is not unknown.

Wylie's operation (see p. 465) of intraperitoneal shortening of the round ligaments by folding each upon itself and stitching was introduced, with subsequent modifications, to do away with the dangers of ventrifixation, and to overcome a disadvantage often urged against Alexander's operation, namely, that adhesions and associated disease

could not be dealt with unless the abdomen were opened. In result this operation suffers from the same mechanical disadvantage as Alexander's in the direction of the pull of the round ligaments.

We now come to two other methods which may be not only safely but advantageously employed when a major operation is indicated. They are methods which have been used by the author for some years, but so far they have attracted little attention in this country.

Gilliam's ventrisuspension operation (see p. 463), and one which may be called the *'sling' operation* (see p. 465). The former should always be employed when there is any degree of descent present, or where extensive adhesions have been broken down behind the uterus. The latter may be employed with confidence in all other cases of retroflexion and retroversion requiring operation, and especially in those in which prolapse of the ovaries is present.

Retroversion and retroflexion of the gravid uterus cannot, strictly speaking, be classified separately, because in these cases pregnancy is only a complication of the preexisting malposition—a condition that is aggravated no doubt by the pregnancy.

Symptoms.—In many cases the uterus rises out of the pelvis normally and no symptoms are produced. If however the pregnant organ become impacted symptoms are marked. At first there is a sense of pressure in the pelvis, and later retention of urine, pain, excessive vomiting, and threatened abortion. It is the retention of urine that most often causes the patient to seek advice.

Treatment.—The bladder must be emptied immediately with a catheter, and the uterus replaced as soon as possible and kept forwards by an Albert Smith pessary until the eighteenth week of pregnancy, after which the fundus will keep forwards of itself.

To replace the gravid uterus the patient should be anaesthetized and placed in the genufacial position, supported by assistants. A volsellum is then fixed on the anterior lip of the cervix and gently drawn down. The manoeuvres described above in regard to ordinary cases of retroversion and retroflexion are carried out, and when the fundus has been pushed forwards the pessary is inserted. In order to clean the pessary it must frequently be removed. Douching must not be resorted to in the pregnant woman lest abortion be induced.

When the uterus is impacted and replacement *per vaginam* is impossible, the abdomen must be opened, and the uterus raised from the pelvis.

It should always be borne in mind that in these cases the uterus almost invariably tends to become involuted in the retroverted and retroflexed position after parturition. Consequently as soon as

the lochia have ceased an Albert Smith pessary should be inserted and worn for a few months, in order that the uterus may be moulded during involution in the normal position. The same precautions must be taken after every subsequent labour.

Backward displacement of the uterus (retroponation).—Displacement of the whole uterus backwards is caused by overdistension of the bladder and bladder tumours. It is an extremely rare condition, retroversion being the position usually adopted in these circumstances.

LATERAL DISPLACEMENT, VERSION AND FLEXION.—These occur either to the right or left (fig. 132). Normally the pregnant

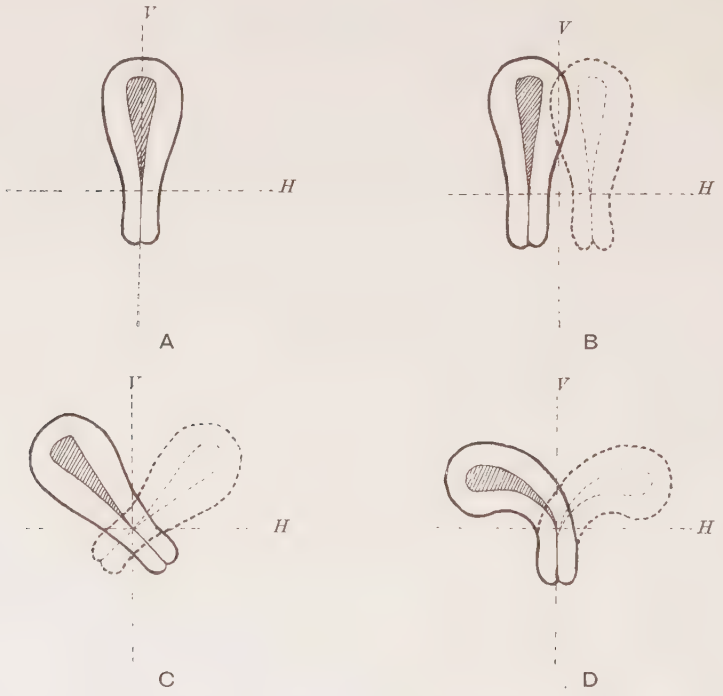

Fig. 132.—Diagram to illustrate lateral derangements of the uterus viewed from the front.

A. Normal position. B. Lateral ponation.
C. Lateral version. D. Lateral flexion.

H. Horizontal line through internal os uteri. *V*. Vertical line.

uterus is slightly turned towards the right side, but all lateral displacements, flexions and versions which are pathological are caused either by the uterus being dragged over to one side, or pushed over to the opposite side.

Under the second heading are included all unilateral pelvic tumours. These may be fibromyomata of the uterus growing into the broad ligament, and broad ligament cysts; parovarian or ovarian tumours, especially when they are situated behind the broad ligament; and retroperitoneal tumours of either side.

In addition to tumours, rapid effusions into the broad ligament caused by infective processes or by the intraligamentary rupture of a tubal pregnancy, are causal factors of these conditions (fig. 133 A).

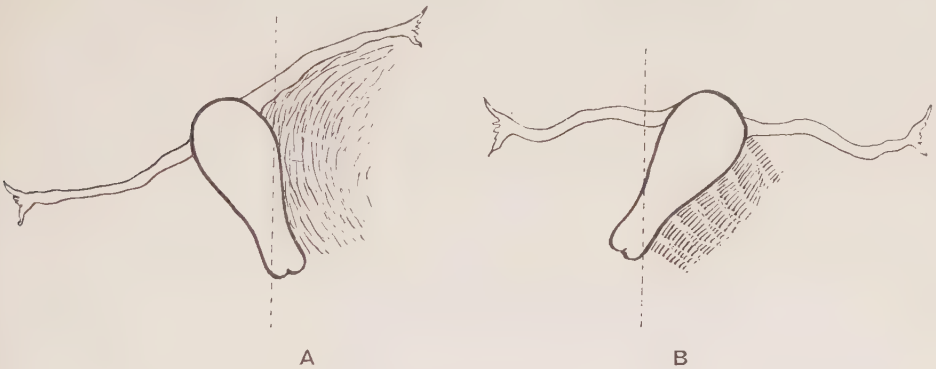

Fig. 133.—Diagrammatic representation of lateral versions. Lateral flexions may be caused in the same way.

A. Uterus pushed over to opposite side by an effusion.
B. Uterus drawn over by cicatrization.

Under the first heading we have only to consider cicatricial contraction of the cellular tissue of the broad ligament subsequent to inflammatory exudation (fig. 133 B).

Lateral displacements are therefore a physical sign of certain pathological conditions, but apart from their diagnostic value they are of no real importance.

UPWARD DISPLACEMENT OF THE UTERUS (SUPERPONATION).—Elevation of the uterus (fig. 134 B) only occurs with the uterus in an anteflexed or anteverted position, because the sacral promontory prevents upward displacement of the retroflexed and retroverted uterus; in the latter conditions the uterus becomes impacted rather than raised out of the pelvis. Elevation of the uterus, then, is the displacement of that organ upwards into the abdominal cavity. This is brought about in three ways:

1. Increase in the size of the uterus beyond the pelvic capacity.
2. The presence of swellings below the uterus raising that organ.
3. Herniae of the uterus.

In the first class the most common cause of upward displacement is pregnancy, for by the time the patient is four and a half months

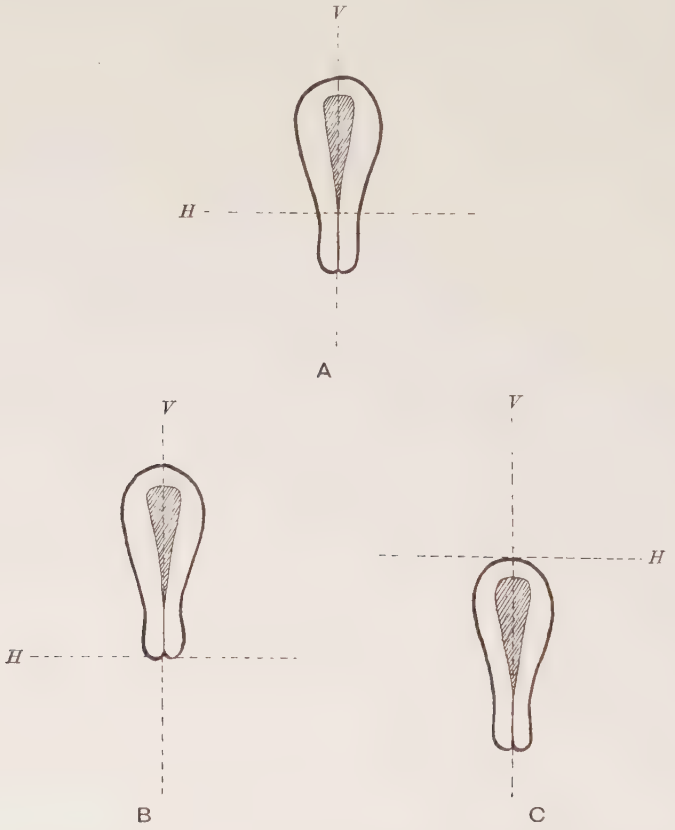

Fig. 134.—Diagram to illustrate vertical derangements of the uterus.
A. Normal position. B. Superponation. C. Deponation (prolapse).
V. Vertical line. *H.* Horizontal line through the normal position of the internal os uteri.

pregnant the uterus is too big for the pelvis. In its ascent the cervix is gradually raised until sometimes, towards the end of pregnancy, it is hardly to be reached.

The only pathological cause of superponation under the first heading is extensive fibromyomatous disease, which increases the size of the uterus, just as pregnancy does, and raises it out of the pelvis, which can no longer contain the enlarging tumour.

Under the second heading there are a good many causes which may operate to push the uterus upwards. A large cervical fibromyoma may fill the pelvis and raise the uterus. In these cases the cervix can often be felt jammed high up against the pelvic brim.

Again, large broad ligament cysts may not only push the uterus over to one side but also elevate it considerably. Ovarian and par-ovarian tumours (chiefly cysts) which fall down into Douglas' pouch may increase in size while in that position, and, getting under the posterior layer of the broad ligament on one or both sides, not only press the uterus close up against the symphysis pubis, but also displace it into the abdomen (fig. 135). In a similar manner haematoceles, the result of ectopic pregnancies, may displace the uterus upwards. Collections of retained discharges in the vagina, especially when menstrual in origin, may raise the uterus out of the pelvis; so, too, more rarely, may large vaginal growths.

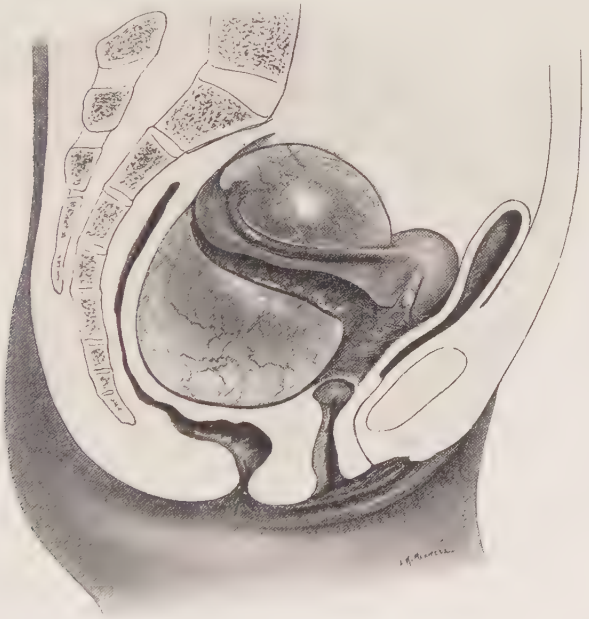

Fig. 135.—Sectional view of the abdomen to show a cyst of the right ovary which is impacted in the pouch of Douglas. The two layers of the right broad ligament have been cut through. The right tube and broad ligament are stretched round and over the cyst and the uterus is elevated and displaced forwards, and in turn has forced the bladder up into the abdominal cavity.

Like lateral displacements, upward displacements are the physical sign of some other pathological condition, and are therefore of diagnostic importance only.

DOWNWARD DISPLACEMENT OF THE UTERUS (DEPONATION; PROLAPSE).—In discussing prolapse of the uterus (fig. 134 c), it is

necessary to consider at the same time the displacement of the vagina which is associated with that condition, and also the displacements of the bladder and rectum, known as cystocele and rectocele respectively, consequent upon prolapse of the vagina.

Rectocele and cystocele may occur without prolapse of the uterus, but this is somewhat unusual; so that, if this exceptional fact be borne in mind, it will be more convenient to discuss the downward displacement of the uterus and the usually associated prolapse of the vagina (with rectocele and cystocele) together. Prolapse of the uterus may be brought about in three ways.

1. It may be a true hernia of the genital organs, which is usually described as being acquired or 'congenital.' This is due to weakness of the pelvic floor which gives way under the strain of intraabdominal pressure, especially when that is increased by coughing, by straining at stool in chronic constipation, or by pathological additions to the contents of the abdominal cavity.

2. The genital organs may be dragged down either wholly or in part by prolapse of the vagina with rectocele or (and) cystocele, a condition of affairs produced by simple hernia of the vagina due to weakness of the pelvic floor or by vaginal growths, such as cysts and fibromata.

3. Increased weight of the uterus may be the primary cause. This is due to enlargements of the body of that organ by tumours, chronic metritis or subinvolution; or to enlargement of the cervix uteri, such as hypertrophy, or a cervical fibromyoma presenting in the vagina.

Now it is obvious that, in whichever class we place any case of prolapse in regard to its causation, there may be several contributory factors from the other classes helping to produce the descent of the uterus. The most important factors, however, are connected with pregnancy. During pregnancy there may be great stretching of the pelvic fasciae, and absorption of supporting subperitoneal tissues which are not replaced; or during labour there may be stretching and laceration of the pelvic fasciae, levatores ani, perineum and vaginal mucous membrane, all of which assist in the support of the uterus.

The structures that maintain the position of the uterus were discussed in Chapter II., so that it is unnecessary here to go more fully into the anatomical aspect of the question until we come to the question of treatment.

'Congenital' prolapse.—We occasionally see cases which are commonly called 'congenital.' These are true cases of herniae of the genital organs in the path of least resistance, but they are not often truly congenital in the sense that the condition is present from infancy;

there is, rather, the potential condition which consists of badly developed supporting structures that allow the uterus as it increases in weight gradually to force its way down. Patients with this complaint usually seek advice, therefore, after having reached puberty. The prolapse may be partial, or complete (procidentia). It cannot be denied that cases of true congenital prolapse do very occasionally occur; such cases have most often been seen in children with the condition known as spina bifida.

The acquired form of hernial prolapse is the common variety, and is well known to all practitioners. It has its origin in the weakening or destruction of the supporting structures by pregnancy and parturition, superimposed on which may be any of the contributing factors mentioned above, such as an enlarged and heavy uterus. Let us only concern ourselves for the moment with the ordinary form of prolapse. Figure 136 illustrates the various stages of prolapsus uteri which may eventually end in procidentia. In the majority of cases the uterus

Fig. 136.—Diagram to illustrate the various degrees of prolapse, and the steps in the progress of the uterus from the normal position to one of complete procidentia. The dotted outlines indicate the structures whose position is subject to alteration during the descent of the genital organs.

1. Normal position. 2. Retroversion and retroflexion with slight descent. 3. Cervix uteri presenting through the vaginal orifice. 4. Complete procidentia with retroversion of the uterus.

first becomes retroverted, and in this position is placed in a direct line with the vaginal channel. As the uterus descends assisted by its own weight, the loose (stretched or torn) vaginal walls are pushed in front of it, or gradually pulled down as the organ sinks lower in the pelvis,

dragging the Fallopian tubes and ovaries after it. At first the infundibulo-pelvic ligament restrains the descent of the ovaries and tubes; consequently the latter become stretched. Eventually, however, the ligament itself gives way, and the tubes and ovaries are dragged down, trailing behind in the wake of the uterus.

If a patient be examined at this stage, on bimanual palpation the practitioner will feel the uterus low in the pelvis, very freely movable, somewhat backwards and with the cervix surrounded by loose folds of vaginal mucous membrane. The uterus feels as if it were just 'sitting' there at the mercy of any strain that may be exerted upon it, and there is no doubt that strain—that is increased intraabdominal tension—is a powerful contributory factor in the ultimate result.

If we now ask the patient to 'bear down,' and to attempt to force the uterus outside, we may notice when we separate the labia that the cervix is just inside the vaginal orifice. Later on as the condition gets worse the cervix comes outside the vulva on exertion, pushing before it, or dragging after it, the anterior vaginal wall with the adherent underlying bladder. Eventually the whole body of the uterus escapes from the vagina, with the cervix ultimately pointing upwards and forwards and the posterior vaginal wall with the rectum attached following after it, if, indeed, some part of the vagina be not pushed before the descending uterus. Figure 137 illustrates the condition as it is frequently seen in the out-patient room. The patient gives a history extending back for many years of 'falling of the womb,' with all the attendant troubles which she has been able to tolerate, perhaps, until frequent friction has gradually caused ulceration of the dry, shiny mucous membrane that has been so long exposed. These ulcers are septic and often bleed freely. Such is the history of an uncared for case of prolapsus uteri. In figure 138 a diagrammatic section of the pelvis is shown, in order that the student may have a clear conception of the relationship of the surrounding parts to the uterus and vagina in a case of procidentia.

The **symptoms** of prolapse of the uterus in the early stages consist of pain in the back, a sense of weight and pressure in the vagina—described by the patient as a 'bearing down sensation'—with possibly some leucorrhoea and menorrhagia due to venous congestion with oedema of the endometrium. Later, as the uterus gets lower in the vagina, the patient may complain of frequent and painful micturition, and more rarely of painful defaecation. If there be any tendency to varicosity of the haemorrhoidal veins this becomes more marked. In the last stages the patient has superadded to her other troubles the discomfort and pain of the protruding—and perhaps ulcerated—mass which makes comfortable walking an impossibility.

The **diagnosis** is always easy. The signs and symptoms, already described, are quite clear in the early stages of prolapse, and complete procidentia should not be mistaken for anything else.

Fig. 137.—Complete prolapse (procidentia) of the uterus. The cervix is pointing forwards, and the vaginal mucous membrane is much ulcerated.

It may, however, be advisable to consider what conditions may give rise to error if a proper examination be not carried out.

Inversion of the uterus (*vide infra*).

Large cysts of the vagina, prolapsed and extruded through the vaginal orifice. The uterus can be felt above the cyst, and a sound passed into the bladder or a finger in the rectum will not pass into the projecting mass, indicating clearly that there is no cystocele nor rectocele. In the case of a cyst, too, the size is not lessened even after its replacement, and evacuation of the bladder or rectum. Cysts of this size are rare, especially in the posterior wall, but are certainly more likely than anything else to be confounded with a prolapse of the vaginal wall.

Fibroma of the vagina or cervix. In these cases the fundus of the uterus can be felt above the tumour.

Hypertrophy of the cervix. On examination the vaginal fornices will be found to be high up and the cervix will be felt and

seen to be occupying the centre of the vagina. On bimanual palpation the body of the uterus can be felt; and on passing a sound (if this should be necessary) the increased length of the passage from the external os is characteristic of cervical hypertrophy.

Treatment.—In the so-called *'congenital' prolapse*, if there be no extensive vaginal descent, Gilliam's abdominal suspension operation should be recommended. If the case be of long standing the uterus may be well outside the vulva and a complete procidentia exist. In these circumstances it will be necessary to do an anterior and posterior colporrhaphy (p. 486) before doing Gilliam's operation.

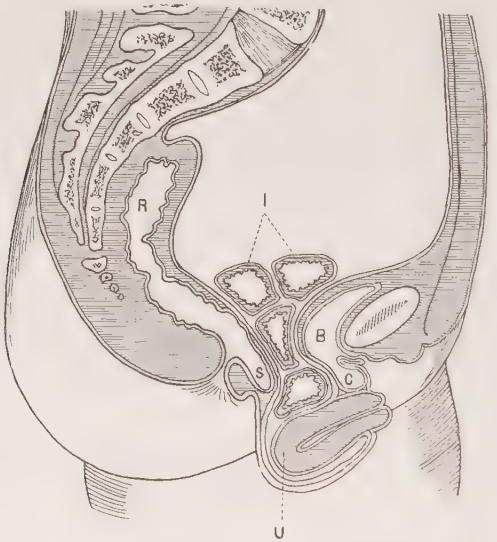

Fig. 138.—Diagram to show the anatomical relationship of the neighbouring parts in complete procidentia.

U. Uterus. *B.* Bladder. *C.* Cystocele. *S.* Rectocele. *I.* Intestines. *R.* Rectum.

This class of case should never be treated by pessary, unless, of course, there be some reason why any operation on the particular patient is undesirable. The patients are usually young and often unmarried, and require curing; it is therefore injudicious to advise anything which continually fixes the girl's attention upon her genital organs, if a cure can be rapidly and certainly effected by suitable operative procedures. In cases of true congenital prolapse the infant usually has other deformities such as spina bifida which lead to early death, consequently treatment is uncalled for.

Before discussing the treatment of an *acquired prolapse* of the uterus, it is necessary to urge strongly how much can be done in the way of prophylaxis if all vaginal and perineal lacerations be repaired.

This should be done, of course, immediately after labour, or, failing that, as soon as the damage is discovered subsequently. In considering the measures to be adopted in the treatment of acquired prolapse of the uterus we are brought face to face with many circumstances and conditions not only in regard to the displacement itself, but also in regard to the patient and her surroundings. As in so many diseases of mankind and their treatment the management of prolapse is very often a question of the circumstances of the patient. In some cases, however, there is only one line of treatment that is right and proper. It is necessary, therefore, that we should take a careful and wide view of the various considerations which all practitioners are called upon to take into account—so common is the complaint.

Let us take first of all the case of the young married woman, who has had one or two children, and who tells us that her "womb has come down ever since the birth of the first child." What are we to do for her? For the most part these women belong to the lower classes of society who lead hardworking lives, with perhaps a biennial ten days' holiday for their confinements. Strain, after the supporting structures have been torn or stretched by parturition, is an important factor in the causation of her prolapse.

Are we to operate upon her, or to make her wear a pessary? This is a very difficult question to decide, for this reason: if we operate a subsequent pregnancy may undo some of the good that our operation has done, whereas the use of a pessary may perhaps keep her comfortable, and she will be *in statu quo* after the next confinement without having gone through an operation as well. We must remember that however much we look upon an operation as a matter of course, we cannot expect our patient to do the same.

That is the broad view—the view many take of the matter. But it is probably too broad a view, and there are cases in which a more definite pronouncement can and should be made, for we must bear in mind the fact that continual use of the pessary is a bad thing, causing leucorrhoea, and being liable to produce other troubles of a more serious nature such as infective ulcers or even carcinoma. This is especially the case among the poorer classes who have not the time to attend to themselves properly, nor the money to pay a nurse or doctor to help them. In the first place if neither the vagina nor the perineum has been torn during parturition it is an exceptionally favourable case for the pessary to afford adequate support; yet, at the same time, if the right operation be chosen, the patient can be cured of her prolapse without the prospect of any trouble after a subsequent confinement, if she again be fortunate enough to be so well managed as not to be 'torn below.'

The best operation for these cases is Gilliam's method of abdominal suspension. If this operation be done, and the utero-sacral ligaments shortened by the abdominal route (see p. 467), a perfect cure results. So that operation should always be advised in cases in which there is no laceration of the perineum or vagina, and in which the prolapse is not of such long standing that a rectocele or cystocele has been formed.

Then there is the case of the same type of woman who has a prolapse associated with a torn perineum and vagina, and in whom there is also a rectocele and cystocele.

Let us take first the simplest kind of case that presents itself for decision. If the vaginal outlet be so damaged that a pessary cannot be retained an operation must be performed. Since that operation involves suture of the vagina and perineum it will surely also be advisable to suspend the uterus by means of Gilliam's operation on the same or a subsequent occasion, for pregnancy makes no difference to the result of this procedure, nor is pregnancy itself interfered with.

There now only remains to be considered in this class of patient the case in which there is prolapse with cystocele and rectocele, in which a pessary can be comfortably worn and gives the patient relief.

In these circumstances the exact state of affairs should be placed before this patient; she should be told that she can be cured by operation, but that part of the result (the vaginal repair) may be destroyed by a subsequent pregnancy, and might have to be done again. On the other hand, the trouble and dangers of a pessary should be brought before her notice, as well as the great advantage of the early repair of all lacerations. Many women, rather than have the trouble of a pessary, submit to operation; others who have a great fear of operation prefer the pessary, owing to the uncertainty (in view of further pregnancies) of a permanent cure by operation, so far as vaginal and perineal lacerations are concerned.

To recapitulate: In the cases of young married women with the prospect of subsequent pregnancies it may be laid down:

a. That those with prolapse without lacerations of vagina or perineum should be advised to submit to Gilliam's suspension operation.

b. That those with serious lacerations of vagina and perineum who cannot retain a pessary should be advised to submit to vaginal repair and Gilliam's operation.

c. That those without serious lacerations of vagina and perineum who can retain a pessary, comfortably and efficiently, and in spite

of a rectocele and cystocele, should be allowed to decide for themselves. At the same time it should be pointed out that operation gives the better final results.

Another class of case we may be asked to advise upon is that of the woman in whom there is little or no prospect of future pregnancies. Either she is a widow unlikely to marry, or she has passed the child-bearing period. She is still active and leads a busy life. She is also at that period of life when vaginal irritation may lead to malignant disease or prey upon her nervous system. Undoubtedly these cases should be advised to submit to operation—vaginal repair if necessary, and Gilliam's method of suspension—unless, of course, there be some constitutional condition present contraindicating operative procedures.

We come, finally, to those cases in which it is sometimes difficult to decide what to advise. The patients are old women with prolapse, in whom complete procidentia is the rule rather than the exception—in the poorer classes at any rate.

Many of them are not fit subjects for any operation at all, and in these we can only advise the use of some form of 'supported' pessary, of which the one illustrated in figure 139 is a clean and useful type; the pessary itself is made of vulcanite. Shoulder braces should always be attached to the belt, but these are not shown in the figure. Cup and stem pessaries and uterine stem pessaries should never be recommended in preference to patterns of the type illustrated, for they are more apt to injure the structures with which they come in contact.

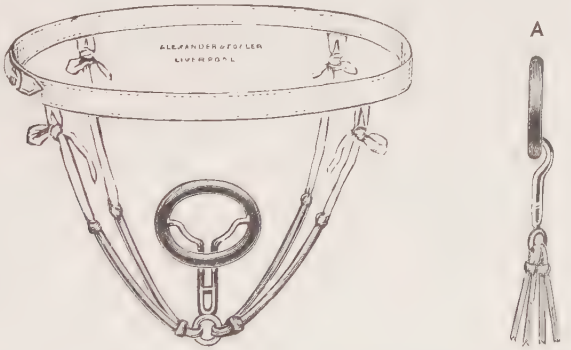

Fig. 139.—Author's supported ring pessary for procidentia. The shoulder braces, which should always be worn, are not shown.

A. Side view of pessary ready for insertion.

But in many cases among the lower classes the prolapsed vagina is so much ulcerated that nothing can be done in the way of an operation or treatment by pessary until a more healthy local con-

dition is brought about. To effect this the patient should be put to bed, the prolapse reduced and the vagina irrigated with stimulating antiseptic lotions—two drachms of tincture of iodine in one pint of water is useful; and for the first few days the vagina should be packed lightly with iodoform gauze after each irrigation and a T-bandage applied. It may be necessary to extend this treatment over several weeks before the vagina is in a sufficiently healthy condition for operative procedures to be carried out, or the pessary worn.

This preliminary treatment applies of course to any case of procidentia with ulceration, whether the condition be congenital or acquired, and the patient young or old. If operative procedures be practised in this last class of case—as is permissible when the patient is healthy and feels greatly the discomfort attaching to her condition —then we may adopt either of two methods, and no hard and fast rule can be laid down: we may effect a repair of the vaginal walls so that the patient can wear comfortably and efficiently the ordinary ring pessary, or we may effect a complete cure.

In these old people the latter must be carried out in two stages: the vagina should be repaired first, and subsequently Gilliam's operation or ventrifixation performed (see p. 462). Very exceptionally removal of the vagina and uterus may be justifiable.

It is hardly necessary to say that when the prolapse of the uterus is part of a general ptosis of the abdominal contents (Glénard's disease) operative or other treatment, directed only towards the descent of the genital organs, can be of little value.

Operations for prolapse.—It is necessary to make a few general remarks here in regard to operative procedures.

It must be distinctly understood that in ordinary prolapse there are many factors at work; that is to say, many supporting structures are destroyed or weakened; and to effect a satisfactory result some attempt must be made to deal with them, although possibly we cannot hope entirely to repair all. It is usual first to deal with the walls of the vagina, and the cervix uteri when necessary.

If the cervix be hypertrophied, diseased or lacerated, it must be repaired or amputated (see pp. 494 and 497); and if the vaginal walls be stretched or lacerated, or the perineum torn, they must be repaired (see pp. 478 to 488). When all is satisfactorily attended to in the vagina we must, if we wish to effect a cure, open the abdomen, and perform Gilliam's suspension operation, to counteract the result of the disappearance of the support afforded by the perivascular fasciae, and when possible the utero-sacral ligaments should be shortened at the same time. In old women a ventrifixation, such as that

described on p. 462, may be performed, if the operator judge it likely to be more efficient than Gilliam's operation, owing to atrophy of the round ligaments.

No good purpose can be served by discussing here the other procedures that have been devised. Various operators have claimed each that his own method is perfect. The author can only state that he has been entirely satisfied with the combination of Gilliam's operation and abdominal shortening of the utero-sacral ligaments following an efficient vaginal repair.

One word of warning is necessary. A Gilliam's operation or ventrifixation should never be performed until the smallest cystocele or rectocele has been repaired. If this be not done the patient will come back complaining of prolapse. In reality she still notices the vaginal condition and nothing will convince her that she is not "as bad as ever." So, as it is much easier to repair the vagina before than after the uterus has been suspended, the former should always be first carried out.

Treatment by pessary.—The ordinary rubber ring pessary (fig. 140) should be used for cases of incomplete prolapse when the practitioner has decided on this method of treatment. These pessaries usually have a central steel wire spring. All sorts of varieties and modifications are on the market, but the simplest are the best. Being made of rubber they soon perish, and become corrugated and unfit for use, so that they must be frequently replaced. Every woman who wears a pessary of any sort must be instructed to use daily a douche of normal saline solution, and the pessary must be taken out and changed every six or eight weeks. Sometimes, if left unchanged for several months or longer, the pessary gets very foul and the vagina sore; it is then necessary to confine the patient to bed for a few days and to use antiseptic douches freely before inserting another instrument.

Fig. 140.—Rubber ring pessary.

Some women become quite expert at removing and cleaning their pessaries daily, a habit to be strenuously encouraged; in fact, every intelligent woman should be taught to do this. On the other hand women are frequently met with in out-patient departments who have

not had the pessary removed for years. One woman had worn a Zwancke pessary for seven years without having it removed, so that it had become buried in deeply ulcerated cavities. There was a foul bloody discharge suggesting carcinoma of the cervix, and the patient was in an emaciated and toxaemic condition. The pessary was removed with bone forceps, but the patient died of pneumonia. At times, too, women are met with who are unaware of the existence of an instrument in the vagina, so that too much emphasis cannot be laid on the danger of neglect to inform the patient fully of the necessity for cleanliness after the insertion of a pessary.

Fig. 141.—Method of holding a ring pessary during the insertion through the vulva and orifice of the vagina.

To insert a ring pessary it is bent into an oval shape and held like a Hodge or Albert Smith pessary (fig. 141) and passed into the vagina in the same way that they are (fig. 143). So soon as more than half the pessary has passed through the vaginal orifice the forefinger is bent into the concavity of the ring (fig. 142) which is then pushed on into position, with the cervix through the centre aperture.

Care should be taken that the same conditions exist in regard to the size as those mentioned in connexion with the Hodge and Albert Smith pessaries.

To withdraw the pessary the forefinger is hooked inside the ring, which is gently removed by drawing it downwards and backwards.

Fig. 142.—Method of forcing the ring pessary into position after it has been passed through the vaginal orifice.

It will now be necessary to describe briefly those cases of prolapse which are brought about by the conditions mentioned above under headings 2 and 3 (p. 170), and to discuss their management.

Prolapse due to increased weight of the uterus.—Increase in size of the cervix, whether due to congenital hypertrophy or inflammatory changes or growths, leads to increased weight and tends to drag the uterus

down. The enlarged cervix, congenital or inflammatory, should be amputated, and any other measures necessary (*v. supra*) must be adopted to relieve the patient. If there be a fibromyoma growing from the cervix, this must be enucleated or the cervix removed.

When the increase in the weight of the uterus is due to disease of the uterus itself, such as fibromyomata, chronic fibrosis and the like,

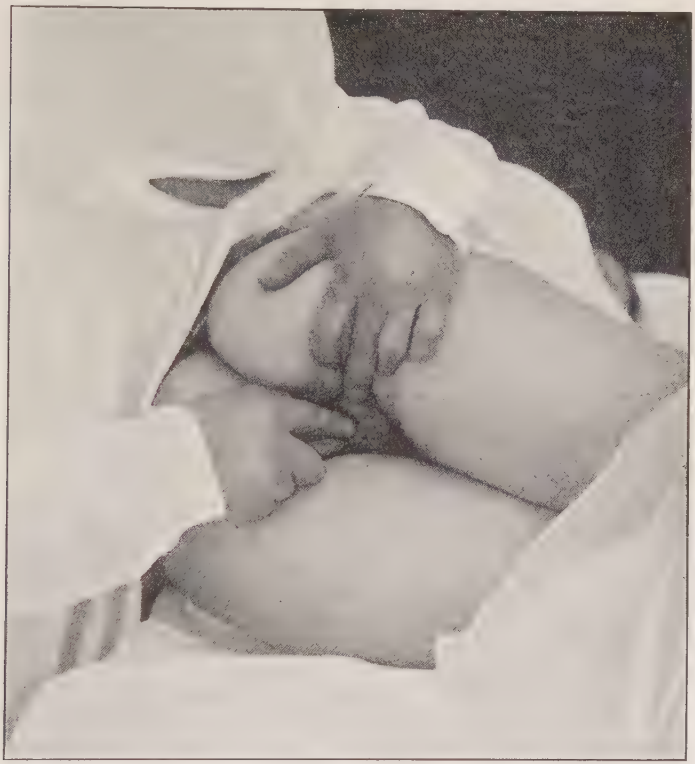

Fig. 143. -Insertion of the rubber ring pessary. First stage: passing the pessary—compressed between the thumb and second finger—through the vulva.

we must turn our attention to the pathological conditions present. Many of these will necessitate removal of the whole or part of the uterus, but the exact interference necessary can only be decided on a close consideration of each case, which will include an investigation into the coincidental symptoms and the degree of disability and displacement.

Chronic inversion of the uterus must also be borne in mind as a possible factor in producing prolapse.

Vaginal displacements.—Sometimes the vagina itself is primarily

prolapsed. This occurs in the form of rectocele or cystocele following lacerations of the vagina during parturition ; or of herniae, which cause bulging of the vaginal wall by forcing their way between the rectum and vagina by way of Douglas' pouch, or more rarely between the uterus and bladder. If the condition be of long standing the uterus itself may be dragged down ; otherwise the continual traction on the cervix may lead to lengthening of the supravaginal portion. The latter condition is seen in those cases where for some reason, either normal or pathological, the body of the uterus is securely supported and prevented from descending.

Again, some tumour such as a fibromyoma or cyst, may cause prolapse of the vaginal wall and eventually lead to prolapse of the uterus. These cases should be treated as soon as possible and any growth removed, or bulging of vaginal wall remedied by the operation known as colporrhaphy (see p. 486).

As already stated, it is impossible to describe prolapsus uteri apart from descent of the vagina, with which it is invariably associated. An attempt has been made, however, to show the exact relation of each to the other, by including here those conditions in which some pathological factor in the vagina may be the primary source of the trouble. It must not be forgotten, however, that in some cases many factors are combined to produce the final result.

OTHER HERNIAE OF THE UTERUS.—Apart from the hernial nature of most cases of prolapsus uteri, which from its very importance and complexity has come to be considered a disease apart, we may also at times meet with the female genital organs in hernial sacs usually occupied by intestine and mesentery.

In young females with herniae, due to congenital patency of the canals—whether inguinal or femoral—ovaries and tubes are very frequently found in the sacs. It is, however, much rarer to find the uterus so displaced although the long rudimentary horn of a bicornuate uterus has occasionally been met with.

Hernia of the uterus through the middle line of the abdomen (ventral hernia) is not unknown. Indeed it has not infrequently been seen associated with pregnancy. In such circumstances the treatment to be adopted is replacement, and the use of a belt until the pregnancy has terminated, when an operation may be undertaken for the cure of the hernia. The radical cure of the hernia should be carried out, also, in cases of inguinal or femoral hernia, with reduction of the contents without removal if they appear to be normal. Care must be taken not to mistake undescended testicles for ovaries.

INVERSION OF THE UTERUS.—This is a displacement whereby the uterus is turned inside out. The causal factors may be divided into two main classes:—

(1) Puerperal.

(2) Growths in the uterine wall.

Spontaneous inversion of the uterus, also, is said to have occurred, but it must certainly be extremely rare and therefore will not be further considered.

It is, of course, obvious that the symptoms may be acute or chronic, according to the length of time that has elapsed since the displacement occurred, and according to the method of production. Since about ninety per cent. of all cases of inversion of the uterus are of puerperal origin, it will be better to discuss the symptoms and treatment of this form first.

(1) Puerperal inversion.—This sometimes occurs when there is an absence of uterine contraction in the third stage of labour. In these circumstances the patient may, by 'bearing down,' invert her own uterus; or the attendant, by dragging on the cord and placental attachment or by pressing unduly on the fundus, may bring about the displacement.

On the other hand, when there is relaxation of the fundus or placental site while the rest of the uterus is actively contracting, inversion may be produced spontaneously and the fundus extruded almost like an intussusception of the bowel. In these circumstances active traction on the cord or undue pressure on the fundus may be the determining factor.

Puerperal inversion, therefore, to a large extent can be avoided by careful management during the third stage of labour.

The inversion of the uterus may be *partial* or *complete*.

Partial inversion occurs when the fundus, or one wall of the uterus, is inverted into the uterine cavity (fig. 144 A and B).

When this partial inversion does not progress symptoms may be absent, and there is no doubt that such a condition tends to undergo spontaneous readjustment as soon as the muscle recovers its tone. It is extremely rare for such a half-way position to be maintained in puerperal inversion.

The practitioner may be able to recognize the condition by feeling a cup-like depression in the fundus uteri through the lax abdominal wall, or his attention may be called to a profuse haemorrhage after the third stage of labour is complete. If in these circumstances he pass the gloved finger into the uterus, to remove clots or possibly placental tissue, he may find an inward bulging on the uterine wall. A careful bimanual palpation will soon convince him that the internal

projection corresponds to a depression on the external surface of the uterus.

The **treatment of partial inversion** is very simple: steady pressure is maintained on the projecting surface inside the cavity, with counter pressure on the uterus through the abdominal wall, until reduction of the partial inversion is accomplished.

The condition known as *complete internal inversion* is the most advanced stage of partial inversion (fig. 144 c). The fundus is completely inverted, but does not project through the cervix uteri.

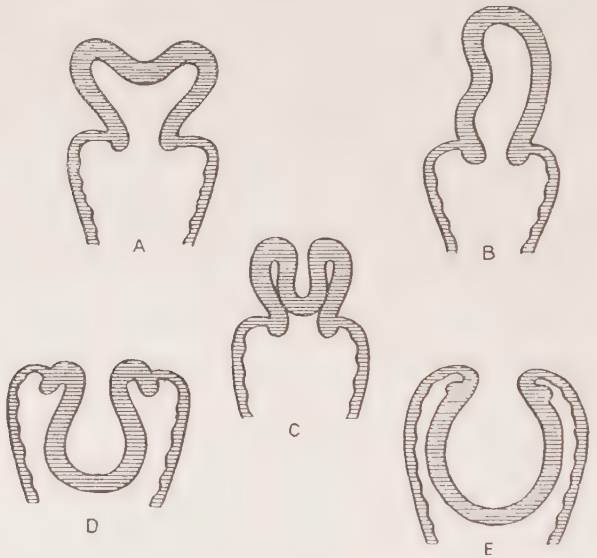

Fig. 144.—Diagrammatic representation of manner and degrees of inversion of the uterus.

A. Partial inversion of the fundus.
B. Partial inversion of the side wall.
C. Complete internal inversion of the fundus.
D. Complete external inversion of the corpus uteri.
E. Complete external inversion of the corpus and cervix uteri.

Complete inversion is a more serious matter. The uterus is suddenly turned inside out and projects beyond the os externum (fig. 144 D and E). As a rule the cervix is not inverted. The physical signs on bimanual palpation are absence of the fundus uteri in the abdominal cavity, and the presence of a rigid ring in the position where the fundus should be. Into this the tubes and ovaries may have been dragged; as a rule the ovaries are arrested at the brim (fig. 145). In the vagina a round soft bleeding mass, surrounded by the dilated cervix, can be felt. The vaginal fornices are in the normal position. According

to the length of time that has elapsed since the inversion occurred the condition may be acute or chronic.

Acute complete inversion.—On inspection the mass in the vagina is usually seen to be of a bright red colour and bleeding. The placenta

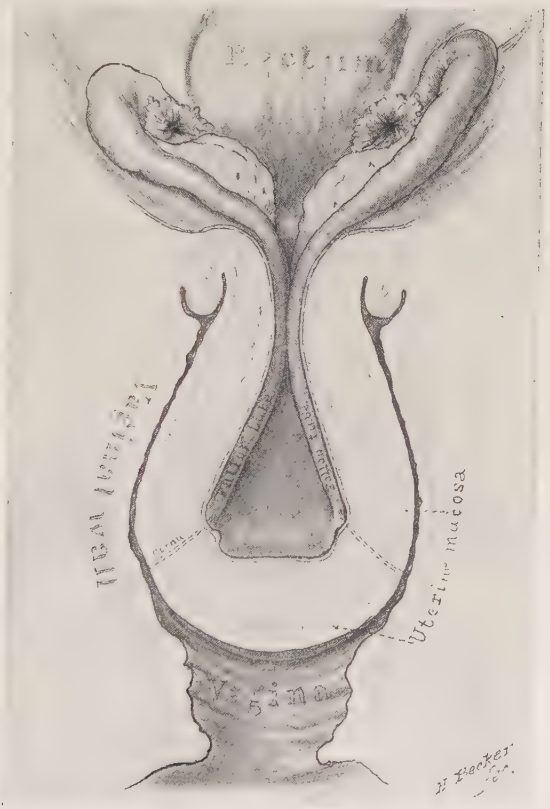

Fig. 145.—Inversion of the uterus, showing the inverted uterine body filling the upper vagina, and the cervical ring through which the inversion has taken place. The ovaries and the Fallopian tubes lie at the entrance to the inversion funnel. (*From Kelly's 'Operative Gynaecology.' By permission of the author, and publishers, D. Appleton & Co., New York.*)

may be attached to the summit or side of it. Careful examination may reveal the openings of the Fallopian tubes. A finger or sound can be passed between the projecting mass and the cervix to the depth of about half an inch all round. If the cervix be relaxed, as is generally the case at first, haemorrhage is favoured and the colour of the mass remains bright red. If the cervix be contracted the inverted uterus is dark purple, haemorrhage is checked, and, if the pressure be maintained, sloughing may follow.

Meanwhile the practitioner will have become aware of grave general symptoms affecting his patient. In some rare cases in which there is very little haemorrhage general symptoms may be absent. Usually, however, there is profuse haemorrhage, great pain and profound shock, and the patient may suddenly become collapsed. A hand is placed on the abdomen to control the haemorrhage; the fundus is not there; the vagina is examined and the protruding mass detected. Instantly the accoucheur should understand what has happened and proceed to reduce the inverted uterus.

Treatment of acute complete inversion.—A hot saline douche is given, and with the gloved hand the operator grasps the inverted uterus in his fingers, compressing the organ and slowly forcing it up through the cervix, which can be dilated if necessary by the finger tips preceding the body of the uterus as it lies in the palm of the hand. The administration of a general anaesthetic may be necessary.

In nearly every case an inverted uterus can be replaced at once. When this has been done an antiseptic intrauterine douche should be given, and a pint or two of normal saline solution must be continuously administered *per rectum* to relieve the condition of shock. Should, however, the displacement not be recognized at the time—and cases unattended by a doctor at the confinement often escape immediate recognition—attention may be called to the woman's condition several days later owing to haemorrhage and the consequent anaemia, or pain of an acute 'bearing down' character. If the patient be seen in this stage an anaesthetic should be administered and an attempt made at reduction with the hand as described above. This will usually be successful; if not, the case must be treated as though it were a chronic one.

Chronic complete inversion.—In those cases in which the symptoms are so slight that the inversion does not come under notice in the acute or subacute stage, the patient usually complains of metrostaxis or menorrhagia, together with slight bearing down pain. She is often very anaemic, and her general condition may suggest grave constitutional disease.

The **diagnosis of chronic inversion** is not so easy as when one has an acute case to deal with, and mistakes have frequently been made. On vaginal inspection one sees a mass which may be ulcerated and sloughing, or if it have escaped strangulation and infection it may be of a dull red appearance. Sometimes the inverted uterus is seen to be mushroom-shaped from pressure of the posterior vaginal wall. The sound will not pass beyond the sulcus between the cervical ring and the mass projecting through it. There is no uterine cavity. Sometimes, too, the apertures of the Fallopian tubes can be seen. On

bimanual examination the fundus is found to be absent from the abdomen, and with a finger in the rectum it may be possible, after drawing the cervix down with a volsellum, to feel the intraabdominal ring with the ovaries on the edge.

The **treatment of chronic complete inversion** depends largely upon the condition of the projecting and inverted fundus. If this be badly infected and sloughing, vaginal hysterectomy will probably be the best course to adopt; but this should rarely be necessary, and should never be performed until some attempt has been made to improve the local conditions, by rest in bed, antiseptic douches and pledgets. An important indication in the matter will be the patient's general condition.

If reposition be decided upon, before that line of treatment is commenced, the patient must be carefully prepared by rest in bed, evacuation of the bowels, and hot antiseptic douches. For two days before replacement is to be attempted the vagina should be well dilated by a large Barnes' rubber bag (fig. 146) connected with a douche-can of warm water. Hydrostatic pressure is thus kept up almost continuously. In this way the vagina is well stretched (as it

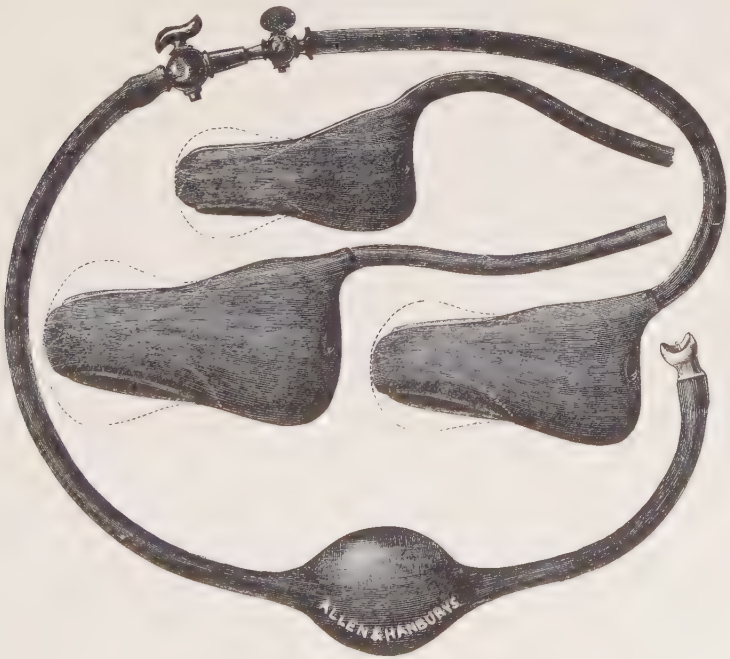

Fig. 146.—Barnes' hydrostatic bags.

is found to be after labour, when manipulations are easy), and an attempt can first be made at manual reposition, as already described,

after the patient has been placed under the influence of opium. Reposition in chronic cases is a slow process and can only be done gradually. If some degree of reduction be effected, a Champetier de Ribes' bag (fig. 147) may be inserted to maintain that advantage, and a further attempt at reduction made subsequently. Should all efforts at manual reposition fail, or be too trying for the patient, it is necessary to have recourse to one of the repositors designed for the purpose. All these instruments are similar in their methods of

Fig. 147.—Champetier de Ribes' hydrostatic bag.

action. One of the earliest and best known is Aveling's repositor (fig. 148). This consists of an **S**-shaped steel rod, on to one end of which are screwed vulcanite cups of suitable size. The cups should always be a little smaller than the mass to be reduced. Consequently if the largest size be first applied this must be changed for a smaller one as reduction proceeds, and the smallest used for the final stage when the fundus is reduced into the uterine cavity. At the other end of the steel rod is a loop into which are fastened elastic bands, two in front and two behind, attached above to a waist belt. There are also shoulder straps, so that a counter pull is obtained. Before the waist belt is adjusted it is advisable to apply a large pad of wool over the centre of the hypogastrium for direct counter pressure; this is kept in position by a binder. The advantage of the **S**-shaped curve in the steel rod is that pressure is applied in the line of the axis of the pelvis; that is, in the direction of reduction.

The cup must be placed in position with the hand in the vagina, while the steel rod is steadied by the other hand. When this has been done, and while an assistant fixes the end of the steel rod, the operator carefully packs the vaginal fornices with gauze. In this way the cup, well surrounded by packing, is kept in position. Too great pressure must not be used, or the uterus will be injured and sloughing occur. The packing should be removed every twelve hours, a douche

given and the repositor replaced. If reposition cannot be safely brought about in this way, or the pain be too great for the patient to bear, the instrument must be removed and antiseptic douches given for two days. At the end of that time, after the patient has been carefully prepared and the vagina rendered as sterile as possible, the abdomen should be opened and the constricting ring divided posteriorly. When this has been done the inverted uterus can easily be replaced by an assistant with his hand in the vagina. The incision in the wall of the uterus is then closed. This is an easy operation, and should be resorted to when any considerable difficulty is experienced in reduction by the other methods described.

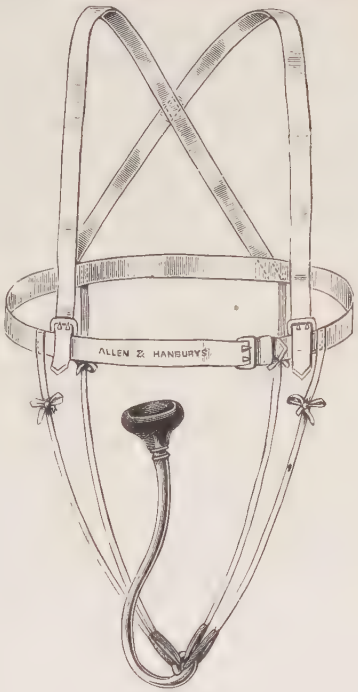

Fig. 148.—Aveling's repositor.

In regard to the treatment of inversion of the uterus, it is interesting to note that adhesions are not formed in the 'cup,' between the opposing peritoneal surfaces.

(2) Growths in the uterine wall producing inversion.—It is extremely rare for growths of the uterine wall to produce *complete inversion.* When this does occur the signs and symptoms are similar to those of chronic puerperal inversion, but are not of so serious a character. In such circumstances the tumour is situated at the fundus. In treating these cases the tumour must be enucleated, and reposition carried out at a subsequent date in the manner already described. If there be other growths present of a similar nature, or if the disease be malignant, hysterectomy should be performed.

Partial inversion, however, is more commonly the condition found (fig. 149), and submucous fibromyomata are nearly always the cause. Sarcomatous and carcinomatous polypi have, too, been known to bring about the displacement. The main interest is in regard to the care necessary in the treatment of these cases. When the growth is malignant the uterus is of course removed, but with a fibromyomatous polypus the growth alone may be removed unless there be many other growths present—a condition extremely unfavourable to inversion. When an extruded fibromyomatous polypus with a broad base is dragged upon partial inversion is almost always brought about, and

unless care be exercised in enucleating the growth, or in cutting through its pedicle, a hole may be made through the inverted uterine

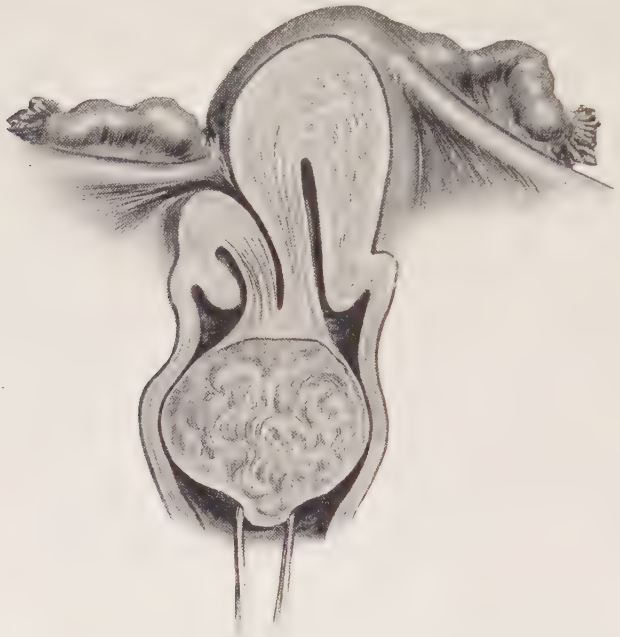

Fig. 149.—Partial inversion of uterus caused by dragging on a submucous fibromyoma in the process of removal. Note the possible danger of cutting through the uterine wall unless the operator keep close to the growth.

wall. The possibility of this will be readily seen if figure 149 be inspected. The wall of the uterus can usually be easily replaced after removal of the growth, and it is always advisable to pack the uterine cavity with gauze for twenty-four hours.

CHAPTER VIII.

DISORDERS OF THE NORMAL PHYSIOLOGICAL CONDITIONS IN RELATION TO MENSTRUATION.

§ i. AFFECTIONS OF PUBERTY.

Puberty may be *precocious* or *delayed.*

In **precocious puberty** children have been known to menstruate from birth onwards, and to be fully developed when a few years of age, so far as the objective signs of sexual maturity are concerned. Such children have been found to possess ovarian tumours which have undoubtedly given rise to abnormal and precocious ovarian stimulation. This is a point which must always be borne in mind in respect to precocious development, for very frequently the tumour is quite small, and can only be detected under an anaesthetic.

In **delayed puberty** we recognize a condition either of physiological inactivity or of definite disease. In regard to the former an unhealthy environment, bad feeding, and similar conditions may delay the onset of menstruation for many years; often, in fact, until the patient is placed in entirely different surroundings, or her health improved. Undoubtedly close association with boys and men has a stimulating effect upon the genital organs of most girls, a fact to be recognized, if nothing more. The treatment of this condition, therefore, usually involves a change of surroundings, and often of the patient's mode of life. The general health, when this is below par without any serious and definite disease being present, must also be improved, for which purpose calcium lactate (gr. xxx alt. nocte)[1] or iron (ferri

[1] Calcium lactate must always be administered in large doses (gr. xxx to 5i) once a day or every other day. It should never be taken repeatedly every few hours. The preparation must be quite fresh, and is best absorbed when taken together with half a pint of water into an empty stomach.

redacti gr. xv t.d.s.) will be found the most useful. These drugs may be conveniently combined when anaemia is pronounced.

There are, also, many pathological conditions which lead to delayed (and possibly absence of the onset of) puberty. These causal factors appear to act directly upon the genital organs and their functions, producing a condition of permanent or temporary infantilism.

It is most important to recognize these conditions, for practitioners are frequently consulted concerning cases of primary amenorrhoea in which the genital organs are perfectly formed, though small, owing to the fact that they have never been actively functional. Many of these cases are quite curable if taken in time; most, however, are unfortunately looked upon as cases of permanent sexual infantilism, and no further trouble is taken with them. In order to avoid repetition the detailed discussion of delayed puberty from pathological causes will be reserved until the consideration of *primary amenorrhoea.*

Abnormal disturbances at puberty.—In addition to the more or less normal conditions and changes associated with the onset of puberty it is not uncommon to find the patient subject to various disorders more or less directly due to the onset of menstruation. Thus the occurrence of sexual maturity may give rise to various **nervous disturbances.** These range from **hysteria** to **sexual insanity**, and are undoubtedly produced by changes in the metabolism which occur at this time. A girl who becomes of an hysterical disposition at puberty has usually behind her a bad nervous family history and in front of her a life of misery. Wise management and guardianship alone can do anything to mitigate the distress these patients cause themselves and others. The worst cases, of course, are those in which the girl becomes sexually insane. The terrible responsibility attaching to these cases is so great that they should never be treated outside of an asylum. The ovaries have been removed in the hope of effecting a cure in cases of sexual insanity, but the results have been extremely bad—acute melancholia frequently supervening. If anything at all be done, removal of *one* ovary only should be tried in these cases. In certain cases removal of the uterus as well as *one* ovary might be the measure adopted. On theoretical grounds these measures undoubtedly hold out a prospect of relief, but no practitioner should be a consenting party to complete castration.

In addition to these more serious conditions, bad habits associated with nervous instability, such as masturbation and pseudo-chorea, are frequently seen, but these may be subservient to efficient moral control.

Mention must also be made here of the fact that the onset of puberty is normally associated with enlargement of the thyroid gland.

As a rule this is only seen in any marked degree during the first two or three years of menstruation. This enlargement is entirely physiological and treatment is quite unnecessary. Advice is, however, frequently sought in the belief that a pathological goitre exists or is impending.

§ ii. AMENORRHOEA.

In the term 'amenorrhoea' are included all those conditions which prevent the normal appearance of blood at more or less regular intervals. Thus there may be *primary* (congenital or developmental) absence or retention of menstruation, or *secondary* (acquired) suppression or retention.

PRIMARY AMENORRHOEA.—This may be due to *local* or *general* causes.

Local causes.—When there is **absence** or **incomplete development of uterus or ovaries** menstruation is necessarily entirely absent. In addition to these malformations, **congenital atresiae** or strictures of any part of the genital tract may lead to the retention and non-appearance of menstruation.

Obviously no treatment can be of any use when the organs are absent or incompletely developed.

When the non-appearance of menstruation is due to an imperforate hymen or to congenital atresiae the menstrual fluid may be retained, and the vagina, uterus and Fallopian tubes—or any part of these channels above the occlusion—may be distended with the characteristic thick dark red-brown coloured or tarry blood, giving rise to the signs and symptoms already described in Chapter V. (p. 124). It is stated by some authorities that there is considerable danger of rupture of the Fallopian tubes in these cases, so that an examination should be carefully and gently carried out.

The **treatment of menstrual retention** is fairly simple when the cause is an imperforate hymen, whether real or so-called (see p. 124). An incision is made through the obstructing membrane, and the retained discharge allowed to drain slowly away. A rapid evacuation is said to favour rupture of the tubes from the dragging on adhesions, but haematosalpinx is very rare with atresiae of the vagina or hymen. Another risk is from infection. The patient to be operated upon must therefore be shaved and prepared with all possible precautions. When the discharge has ceased to flow irrigation of the vagina with an antiseptic solution should be employed, a gauze plug inserted into the vagina and a dressing applied externally.

When there is an atresia of the cervix or upper part of the vagina a definite plastic operation must be undertaken to reach the collected fluid, and to cure the condition and prevent recurrence.

In cases of retention of menstrual discharge of long standing, when the patient is, perhaps, over thirty years of age, removal of the dilated uterus and tubes is generally the best line of treatment, for there is no possibility of a return to the normal state. Indeed it is probable that only cases of haematokolpos relieved very early recover entirely. In passing, it may be well to recall attention again to the fact that *haematokolpos, haematometra* and *haematosalpinx* may occur in one half of a double or septate condition of the genital tract. The principles of treatment are governed by the conditions obtaining. In these cases, which are somewhat rare, menstruation may take place from one side while an accumulation is going on in the other.

General causes.—The general causes producing primary amenorrhoea and eventually, if unrelieved, permanent sexual infantilism are metabolic in character and action.

(1) **General arrest of development after birth.**—It has been asserted that it is the imperfect development of the sexual organs which leads to the general arrest of development; but this is not borne out by experiments upon animals. No treatment in the present state of our knowledge is of any use in this condition, which is probably dependent on the ductless glands. Many of the patients are imbecile.

(2) **Congenital** or **early acquired pituitary gland (hypophysial) disease.**—Tumours of, or in the neighbourhood of, the pituitary body are somewhat rare, especially before puberty. When present, however, they invariably lead to sexual infantilism by interfering with the function of the hypophysis. Treatment in these cases is hardly out of the experimental stage at present.

(3) **Hypothyroidism** and **athyroidism** are now so well known that it is only necessary to point out that the patient may be a cretin with almost total absence of thyroid activity (athyroidism); or she may be suffering from myxoedema, which is extremely rare in childhood, or merely from a slightly deficient thyroid secretion (hypothyroidism). Treatment by thyroid gland is indicated in all these cases. Cretins are easily recognized, and belong to the province of pure medicine, as do the early cases of myxoedema. Very often, however, cases of slight hypothyroidism fall first of all into the hands of the gynaecologist, for the most important symptom to an observant mother is primary amenorrhoea. Reference to what has been said already in regard to the physiology of the female genital organs will make the subject

clearer (see p. 69). The treatment of these cases is gratifying if undertaken in time before uterine infantilism becomes established.

SECONDARY AMENORRHOEA is due to *local*, *general* or *physiological* causes.

Local causes. (1) **Atresia** of the whole of the genital canal or any part of the cervix or vagina may arise from inflammatory changes consequent upon injury, subsequent to laceration during parturition, or resulting from the caustic or other destructive treatment of local disease. *Haematokolpos*, *haematometra* or *haematosalpinx* which may follow must be treated on the lines already indicated.

(2) **Operative procedures** which involve removal of the uterus naturally lead to cessation of the menses. When the uterus is removed and the ovaries are left the patient frequently suffers from slight menopausal symptoms (*v. infra*), and it is probable that the ovaries themselves atrophy after a few years.

With the removal of the ovaries the menses usually cease, but this does not occur in a fair percentage of all cases. Various reasons, such as the incomplete removal of the ovaries, the irritation of the pedicle stumps and a fibroid tumour in the uterine wall, have been assigned to the continuance of the catamenia after oöphorectomy. Strictly speaking, in the present state of our knowledge any bleeding of this sort can hardly be looked upon as *normal* menstruation; but we have to remember that menstruation itself is a process of late evolution, and not dependent upon ovulation, and that it cannot be correctly interpreted in respect to this point by experiments upon the lower types of animals, which in many cases possess ovaries of very different structure from the human ovary (see p. 36). It is, in fact, possible that menstruation may continue for a time in the absence of ovaries—removed by operation. Usually, however, the uterus gradually becomes entirely fibrous, containing only a few scattered glands (fig. 150).

(3) **Superinvolution.** (See p. 227).

(4) **Deficient ovarian secretion (hypooöphorism).**—In the present state of our knowledge it is impossible to say more than that it is probable that there may be deficient internal secretion of the ovaries as a primary affection—just as deficient secretion of the thyroid occurs—and that some of the cases of amenorrhoea in young girls are due to this cause. The condition may be quite temporary.

(5) **Extensive ovarian disease.**—Total destruction of ovarian tissue from cystic or other pathological changes is a common cause of secondary amenorrhoea. The function cannot be reestablished, although ovarian grafting may some day be a recognized and efficacious procedure in cases in which the uterus is not atrophied. The evidence

we already possess of a clinical and experimental nature points to ultimate success in this direction.

(6) **Extensive inflammatory changes** in connexion with the Fallopian tubes and ovaries may produce the same effect as extensive degeneration, and the prognosis and prospects of treatment are the same in the two circumstances. (*See also Menorrhagia*, p. 199.)

General causes. (1) **Blood diseases.**—*Primary anaemia* in which the haemoglobin content is low (chlorosis) is one of the commonest

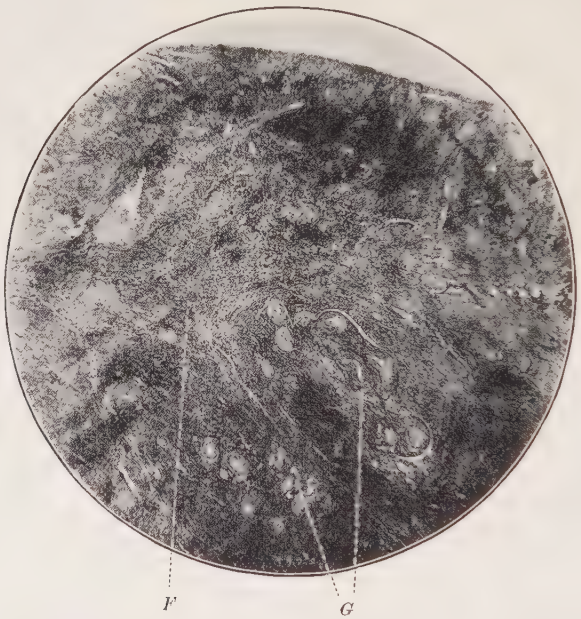

Fig. 150.—Section of the human uterus four years after double oöphorectomy. ×75. (*Photomicrograph.*)

F. Fibrous stroma. *G.* Compressed glands of the endometrium.

conditions associated with amenorrhoea. It is probable, however, that the anaemia is not directly responsible for the disappearance of menstruation, but rather that each is the result of some general metabolic disturbance. These cases are very successfully treated by large doses of ferrum redactum. This is best prescribed in a bread and butter sandwich in gradually increasing doses—gr. iii up to gr. xv t.d.s. after food; saline aperients are usually necessary at the same time to correct the constipating effect of the iron.

Secondary anaemia, the result of gastric or other forms of haemorrhage, is also a direct cause of amenorrhoea. This must be treated on general principles, menstruation returning as the health of the patient improves.

(2) **Nervous disturbances.**—The nervous system appears to exert a very potent influence on the functional activity of the female genital organs, so that any mental disturbance may lead to amenorrhoea. It must be borne in mind, however, that the opposite effect is often produced. The commonest nervous disturbances producing amenorrhoea are *insanity*, generally of the melancholic type; *shock*, such as that induced by an accident; *marriage* and the primary effect of sexual connexion on some women; *expectancy of* or *desire for pregnancy*, and the *fear of pregnancy* such as is frequently seen in unmarried women who have slipped from the path of virtue.

These cases must be dealt with on general principles. No specific treatment need be indicated. Removal of, or recovery from the inhibiting factor will cause the menstrual function to be reestablished. In the case of the amenorrhoea of early marriage this is usually temporary, and either becomes merged in that of pregnancy or disappears.

(3) **Causes due to environment.**—As has already been pointed out the idea formerly clung to, in spite of obvious facts to the contrary, that menstruation was an unalterable habit, has long been given up, and it is recognized that not only changes of climate but other changes in environment may influence menstruation. Amenorrhoea supervenes very frequently on a change from a hot climate to a temperate or cold latitude. In this connexion it is interesting to note that Eskimo women frequently menstruate with very little or no bleeding. As a rule acclimatization is all that is necessary to produce a normal state of affairs compatible with the altered circumstances.

Alterations in the life of any woman which lead to her being engaged in work not adapted to her physical requirements, or in work and surroundings which change her character and natural instincts, frequently lead to irregularity or even suppression of the menstrual functions, indicating clearly the sacrifices women have to make if they leave the spheres which are suited to their proper activities.

(4) **Acute and chronic disorders.**—Among the acute disorders which cause suppression of menstruation the common '*chill*'—due to exposure to cold or wet—must be regarded as the most frequent. If the 'chill' be contracted about the time the menses should appear the patient may suffer from great pelvic pain and general discomfort. For such a condition hot baths, hot fomentations on the hypogastrium and hot drinks should be employed, together, if necessary, with drugs which cause vasodilatation, of which *spiritus etheris nitrosi* is a simple and efficacious example. Great care must be taken, however, not to encourage alcoholic indulgence for the relief of menstrual disorders. It is far too common in this country for girls in the upper classes to

take to bed with a strong hot brew of gin or brandy every month, a habit which often leads to a too free indulgence in alcohol on the slightest excuse, and in time without any at all.

When the amenorrhoea is due to an *acute illness* no attempt should be made to interfere with the conservative efforts of nature. The reparative value of the calcium salts is such that none can be spared for excretion in these conditions, consequently milk disappears from the breasts, menstruation ceases, and constipation ensues. Such facts indicate that the administration of calcium salts may be required to assist the processes of resistance.

In *chronic debilitating diseases,* such as *tuberculosis,* amenorrhoea is frequently seen. (*See also Menorrhagia,* p. 200.)

Just as in the production of primary amenorrhoea, so, too, will *pituitary* (*hypophysial*) *disease* and *myxoedema* invariably cause secondary amenorrhoea with atrophy of the genital organs if not relieved sufficiently early in their course. At present the treatment of pituitary disease with the extract of that organ is not very satisfactory. Myxoedema can be specifically treated with thyroid gland without any doubt as to the result. Interesting cases of the reawakening of the genital functions, and of pregnancy following thyroid treatment for myxoedema have been recorded.

(5) **Drug habits.**—Of these morphia is the best known. Women addicted to morphia generally suffer from amenorrhoea sooner or later. This symptom may, therefore, assist in the discovery of the habit.

Physiological causes.—These are *pregnancy, lactation,* and the *menopause.* It is an almost invariable rule that menstruation ceases during *pregnancy,* even when the pregnancy is ectopic or in a bicornuate uterus. At the same time it is necessary to remember that some women menstruate from the lower uterine segment during the early months, or even throughout the whole period of normal pregnancy. In ectopic gestation, also, while usually there is amenorrhoea until rupture of the tube or abortion of the ovum through the ostium abdominale occurs, the patient sometimes menstruates normally. So, too, with pregnancy in one horn of a bicornuate uterus the woman may menstruate regularly from the other horn.

During *lactation* probably 75 per cent. of the women concerned do not menstruate for about nine months, although menstruation may become reestablished at any time. If this occur the milk may disappear from the breasts or become of a very poor quality. At the *menopause* women frequently have long periods of amenorrhoea, which is simply an indication of the decline of the physiological activity of the genital organs.

§ iii. MENORRHAGIA.

'Menorrhagia' is the term applied to too profuse or too protracted and profuse menstruation. It is at times somewhat difficult to separate this condition from more purely pathological bleeding. The term 'metrorrhagia,' which is used to indicate intermenstrual haemorrhage, is confusing and superfluous. If the bleeding occur at a menstrual period, whether the periods recur every six weeks or once a fortnight (and women may vary almost normally between these limits), then it should be considered menorrhagic. Bleeding at any other time is of a different character, and if dignified by an independent appellation should be termed 'metrostaxis.' Much confusion about menorrhagia arises through the use of the inconvenient and too similar term 'metrorrhagia,' which not infrequently is wrongly applied to menstruation recurring fortnightly.

The causes of menorrhagia are *local* and *general*. It is of importance to remember that menorrhagia in girls and quite young women is usually due to some *general* etiological factor; and that in this condition in married women over twenty-two or twenty-three years of age, who have previously menstruated normally, some *local* cause is most often found.

Local causes. (1) **Tumours of the ovaries.**—*Small* tumours, cystic or solid, of the ovaries very frequently give rise to menorrhagia.

(2) **Inflammatory conditions** of the ovaries, tubes, uterus, peritoneum and cellular tissue cause increased menstrual bleeding by increasing the blood supply, and also by creating hypersensitiveness and activity of the genital organs.

(3) **Diseases of the uterus** may either increase the menstrual discharge, or may of themselves give rise to haemorrhages at the menstrual periods. These diseases are *innocent growths of the uterus* (adenomata, including 'endometritis' and 'erosion,' fibromyomata, polypoid or otherwise, and cysts); *malignant growths; simple ulcerations and lacerations due to trauma; displacements* (inversion, retroversion, prolapse); *subinvolution*; and *alterations in the structure of the blood vessels or structure of the uterus*, such as are seen about the menopause (*v. infra*).

(4) **Enlargement and hypersecretion of the ovaries**, or of one ovary (hyperoöphorism). This usually occurs in unmarried or sterile women.

It may be suggested that when menorrhagia is due to enlargement of the ovary with hypersecretion, a portion or the whole of one ovary should be excised. Cases of apparently intractable menorrhagia,

in which removal of the uterus has been contemplated, have been cured by this procedure.

(5) **Extragenital causes.**—*Tumours* arising from the kidney or elsewhere; *hydatids*, and all those other rare tumours which may arise or be situated in the pelvis, by pressing upon or otherwise irritating the genital organs, may give rise to menorrhagia. In one case a cyst of the mesentery resting on the fundus uteri led to the appearance of the menses every fortnight and caused them to last a week.

The **treatment** of menorrhagia due to local conditions is, then, that of the causal factors, and will therefore be more appropriately discussed under the pathological conditions in question.

General causes. (1) **Blood diseases.**—These are *haemophilia*, *purpura haemorrhagica* and *scurvy*, all of which must be treated on the general lines for the treatment of these diseases laid down in text books of medicine.

(2) **Acute** and **chronic constitutional diseases** are, as has already been said, more frequently associated with amenorrhoea, but it is by no means rare to see violent menorrhagia in the later stages of an acute illness. During convalescence amenorrhoea may again occur. In chronic diseases such as phthisis it is not uncommon to see excessive bleeding at the 'period.' This usually only occurs occasionally, when the patient is menstruating regularly. By far the most efficacious remedy for these cases of menorrhagia is the administration of calcium lactate in gr. xxx doses on alternate nights, a method of treatment which should at once be adopted if the menorrhagia seem likely to continue from month to month.

Under this subdivision we must include *general debility*, which leads to loss of tone of all the muscles, voluntary and involuntary, throughout the body. The uterine muscle becomes atonic, and menstruation is prolonged. The proper treatment for these cases in which there is loss of muscular tone is a course of Swedish exercises, and the administration of calcium lactate. Sometimes electrical treatment is of considerable value.

It may be as well to explain here the apparently paradoxical use of calcium salts recommended. It has already been stated (p. 191) that they are of value in certain cases of amenorrhoea; and here they are recommended for some forms of menorrhagia.

In the earlier chapters it was mentioned that menstruation was largely dependent upon the excretion of calcium, just as in the case of hens the laying of eggs is to a great extent dependent upon a supply of lime, and entirely upon the amount in the bird's blood. Consequently it is sometimes necessary to supply calcium salts in order to allow the organism sufficient for excretion and the production of menstruation.

But in many cases of menorrhagia, while the organism is able to excrete sufficient to start menstruation, which is associated with a great fall in the blood calcium content, it cannot supply enough to the blood to stop that function. For the cessation depends upon a reaction on the part of the organism, whereby calcium salts are accumulated once more in the blood, raising the tone of the blood vessels and uterus, and, possibly, increasing the coagulability of the blood.

To recapitulate: menstruation can only occur when there is a sudden excretion of the excess of calcium from the blood—such excretion only occurring when there is an excess; and secondly the flow only ceases when the blood has been able to readjust its calcium content.

(3) **Cardiac disease** is sometimes associated with profuse menstruation even when there are no back-pressure symptoms. In these cases it is advisable that the patient should go to bed on the day before the menses are due and stay there until they are over. An examination of the heart should always be made in obscure cases of menorrhagia, since it is common to find excessive menstruation associated with mitral stenosis in young women.

(4) Any **obstruction of the inferior vena cava or pelvic veins**, produced by growths, by general back-pressure or by chronic constipation may lead to menorrhagia.

(5) **Disorders of the nervous system**, such as *insanity* (of an active type); *shocks* through an accident or fright; *strong emotions*; the results of *sexual excitement* or excess, whether through too frequent connexion or masturbation; and the effect of *sexual abstinence* with the stimulation of sexual desire may cause menorrhagia. The last is somewhat common, and one is occasionally consulted by young women with profuse and too frequent menstruation entirely due to the fact that the patient is 'engaged,' and presumably enjoys the limited yet exciting intercourse allowed by society in these circumstances. These and other profuse but temporary forms of menorrhagia may often be successfully treated with cotarnine phthalate (gr. ii 4^{tis} h.s. p.r.n.).

(6) **Alcoholism.**—Menorrhagia is frequently seen in chronic alcoholics, who may have cirrhosis of the liver or degenerate arteries, and must be treated on general lines.

(7) **Hyperactivity of the thyroid gland** in young girls is one of the commonest causes of menorrhagia before adult life. With the establishment of a metabolic equilibrium the condition tends to right itself, but some cases call for treatment.

Primary *exophthalmic goitre*, also, as we should naturally expect from what we already know of the relation of this gland to menstruation, is frequently associated with menorrhagia in the early stages of

the disease. In the later stages, menstruation usually ceases. The treatment of these cases is that adopted for exophthalmic goitre; this chiefly consists of rest in bed. The drug of greatest value appears to be calcium lactate, which slows and steadies the heart, controls the vasomotor system, and lessens the haemorrhage. Indeed in the moderate grade of hyperthyroidism seen in young girls treatment with calcium lactate alone is usually sufficient.

(8) **Bright's disease.**—Menorrhagia in this disease is due to arterial degeneration, and is beyond the scope of gynaecology in regard to treatment.

(9) **Hyperlactation.**—In the out-patient department, and in poor class practice, menorrhagia is very commonly seen as the result of prolonged nursing. Poor women frequently nurse their infants for fourteen, sixteen or eighteen months, even for two years, in the expectation that by so doing they will be able to avoid conception—quite a mistaken idea, needless to say. By this long continued nursing they not only frequently rear ricketty and badly developed children, but also reduce themselves to a very serious state of health. Often they do not seek advice until frequent and prolonged bleedings (at first menstrual, but later continuous) compel them to do so. Fortunately the treatment is simple and satisfactory. It is possible to transform a worn-out, heavy-eyed, neuralgic and bleeding woman who often can hardly stand, into a healthy woman in a few weeks by weaning the child and by giving the mother good food and rest. Lactate of calcium should also be prescribed, to replace the calcium salts drained from her system in her milk.

(10) **Menopause.**—Menorrhagia is very frequently seen about the *menopause*, and is sometimes associated with periods of amenorrhoea. *In these cases of menorrhagia occurring late in life the suspicion of cancer of the uterus must be entertained and excluded.*

§ iv. DYSMENORRHOEA.

'Dysmenorrhoea' is the term used to denote painful menstruation. This pain may have a definite time relation to that function; that is, it may be before (premenstrual), during (menstrual), or after menstruation (postmenstrual). Some authorities go so far as to include periodic pain between the menses (intermenstrual) under the heading of dysmenorrhoea, but this is hardly justifiable.

Many classifications of dysmenorrhoea have been made, most owing to the ignorance which has existed in regard to the normal physiological processes. Recent researches have enabled us to come to a

better understanding of the more obscure forms of this disease. The best way, then, to classify cases of dysmenorrhoea is to divide them firstly into those due to the *imperfect action of the normal physiological processes*, and secondly into those which arise from *acquired pathological conditions of the uterus or surrounding parts.*

In all cases it must be borne in mind that in estimating pain the individuality of the patient herself must be taken into account, for symptoms may be much exaggerated by a woman of a neurotic temperament.

DYSMENORRHOEA DUE TO IMPERFECT PHYSIOLOGICAL PROCESSES.—In this class of case the pain is due, whatever the cause, to *uterine colic* and is *menstrual* in time, so that the old term 'spasmodic dysmenorrhoea' really includes all the conditions to be mentioned in this group.

The painful uterine contractions are caused by a variety of factors, and it will be best to take each separately, in order that the treatment may be made clear—remembering the while that the pain produced in each case is uterine colic. This type of pain only occurs during the period of menstrual discharge, when regular uterine contractions normally occur. Knowing how much pain intestinal colic may cause we can easily imagine that the *irregular* action of the far more powerful uterine muscle may also give rise to violent pain. The following are the disordered physiological conditions which may produce irregular and painful uterine contractions.

(1) **Distension of the uterine cavity by clots.**—This is a very frequent cause of dysmenorrhoea, and is more severe in nulliparae than in multiparae. The accumulation of blood in the cavity of the uterus may be due to want of tone in the muscle fibres, so that contractions are only stimulated, and then violently, when a clot has formed. Associated with this want of tone in the muscle walls may be an unhealthy condition of the lining membrane, giving rise to excessive bleeding and the formation of clots.

The **treatment** is firstly directed to improving the condition of the endometrium by curettement. Subsequently, in order to insure better muscular tone and less profuse discharge of blood, such as is usually seen in this condition, calcium lactate (gr. xxx alterna nocte) should be given continuously for several months. Excellent results are often obtained in this class of case by the administration of calcium lactate without curetting. Electrical treatment has also been found to be of considerable value in these cases.

(2) **Imperfect wave of muscular contraction.**—This is frequently associated with an imperfectly developed organ, with congenital flexions

and with stenosis of the cervix, and the condition is one of the most difficult to treat in regard to the dysmenorrhoea associated with it. It is probable that the uterine colic in this class of case is caused, not by obstruction of the canal as has so often been stated, but by the interruption of the wave of the muscular contractions by a ring or area of non-contractile tissue.

We must consider this form of dysmenorrhoea to be due to a physiological disturbance since the causal factors are structural, and the muscle fibres are unable to contract as they normally should during menstruation.

The **treatment** to be adopted in these circumstances is surgical. The cervix must be dilated and hysterotomy performed. That is to say the uterus is split along the median line—in front in anteflexion, and behind in retroflexion. Thorough curetting is performed and the incision in the wall of the uterus subsequently closed with catgut sutures as far as the vaginal vault, and the mucous membrane of the vagina sutured in position (see p. 502). The uterine cavity is packed with gauze for twenty-four hours.

Sometimes great relief follows the operation, but the prognosis is always somewhat doubtful.

It has also been stated recently that excellent results follow electrical treatment. This, however, is not so likely to occur as in uterine colic due to imperfect muscular tone.

Many drugs have been vaunted for the relief of dysmenorrhoea. In this special class—where most required—they nearly always fail to produce the desired effect. The coal tar products, such as phenazone, may give some relief, but should only be taken under direct medical superintendence. Guaiacum resin (gr. x t.d.s. for a few days before the onset of menstruation) is said to have a good effect in many cases, but it is doubtful if such belong to this type in regard to the causal factor.

There is no doubt that pregnancy, which unfortunately rarely occurs in this class of case, is the best and most natural form of cure.

As a rule, however, the surgical procedures described above offer the best prospect of success.

(3) **Exfoliation of the endometrium** ('membranous dysmenorrhoea').—This is probably a commoner cause of dysmenorrhoea than is usually believed, owing to the fact that many have considered that for her condition to come within this category the patient must pass large casts of the uterus which are hollow in the interior, and have apertures for the orifices of the Fallopian tubes and cervical canal. In the worst instances undoubtedly membranes of this description are passed, but in

the majority of cases of 'membranous dysmenorrhoea' the membranes passed are not large (fig. 151). It is, too, to be noted that at one time the patient may pass a complete cast of the uterus, and at another mere shreds, which have no cavity in the interior nor general resemblance to the more complete cast.

Fig. 151.—Cast from a case of exfoliative (membranous) dysmenorrhoea. (*Natural size.*)

Many theories have been held as to the etiology of 'membranous dysmenorrhoea.' At one time these casts were looked upon as the products of conception; at another—and by some still—as the result of a fibrinous exudation. The most probable explanation is that the condition is caused by a more extensive denudation of the superficial layers of endometrium than occurs during normal menstruation. This denudation is effected by an extensive lacunation or extravasation of blood under the lining membrane of the uterus, and instead of the blood and secretion from the glands breaking through the endometrium with slight and fragmentary detachment of that membrane, the collecting fluids detach the whole or an extensive area of it. Now there are probably two factors at work to bring this about: first an abnormally dense condition of the superficial layers of the lining membrane of the uterine cavity, and second a very rapid extravasation of blood which quickly strips up this dense endometrium, instead of slowly working its way through that membrane. This explanation is borne out by the fact that menorrhagia is usually associated with this form of dysmenorrhoea.

The recognition of the cast is an important matter, for it must be distinguished from the foetal membranes passed in connexion with an aborted ovum, and from the decidual membrane passed during an abortion, or after the determination of an ectopic pregnancy. If the young ovum be seen alone the membranes surrounding it are very shaggy owing to the chorionic villi (fig. 157, p. 223). On section these chorionic villi dispose of any doubt as to its nature (see fig. 160, p. 225).

The decidual membrane from the uterus during an abortion, or after the determination of an ectopic pregnancy, of itself somewhat resembles the complete cast from a case of 'membranous dysmenorrhoea' as regards the naked-eye appearance. Microscopically, however, the large decidual cells seen in the 'membranes' resulting from conception help one to come to a conclusion as to the nature of the specimen (see fig. 159 p. 225). But since it has been shown that decidual reaction may occur independently of pregnancy and to some extent in

'membranous dysmenorrhoea,' care in basing the diagnosis on a purely microscopical examination must be exercised by those who have not had a large experience in the recognition of these specimens. When a decidual membrane is passed we are always assisted by the knowledge that in ectopic pregnancy there is evidence of that condition to help one to decide, and also by the statement of the patient that she is not in the habit of passing shreds. The typical microscopical appearance of the cast from a case of 'membranous dysmenorrhoea' is seen in figures 152 and 153. There is a somewhat condensed—almost decidual—endometrial stroma (fig. 153) in which may be occasionally seen portions of what have been described as 'crumpled' glands (fig. 152) or gland epithelium cells. It is not a product of exudation. In a more or less perfect cast all the superficial elements of the endometrium are represented in anatomical order and relationship.

The patients are usually young, but may be of any age. Sterility has always been held to be a constant accompaniment of this form of dysmenorrhoea, and though this is not inevitably and always so, these patients are usually sterile; and pregnancy, if it should occur, does not necessarily improve the condition subsequently. Indeed cases are not unknown in which exfoliative dysmenorrhoea has appeared for the first time after pregnancy.

The pain, which is due to the expulsive efforts of the uterine muscle, is usually very severe; exceptionally no pain attends the passage of the membrane.

Treatment in the past has not been very successful, but with more light upon the etiology of the disease there appears to be a prospect of obtaining better results. Bearing in mind the etiological factors at work we must first endeavour to improve the condition of the mucous membrane. Thorough curetting—and to do this the uterus should be opened anteriorly (see p. 502)—and the cauterization of the interior of the uterus with iodized phenol should be carried out. Ionization of the uterus may be tried should this local treatment prove ineffective. We must also consider how best to prevent the haemorrhagic condition which is also present. For this purpose calcium lactate should be given regularly between and during the menstrual periods in the doses previously mentioned. Any other principles of hygiene or therapy that are considered necessary to improve the general health of the patient may also be advantageously employed.

DYSMENORRHOEA CAUSED BY ACQUIRED PATHOLOGICAL LESIONS.—Any abnormal condition of the uterus and surrounding parts, such as is caused by displacements, growths or inflammation, may give rise to dysmenorrhoea of this type.

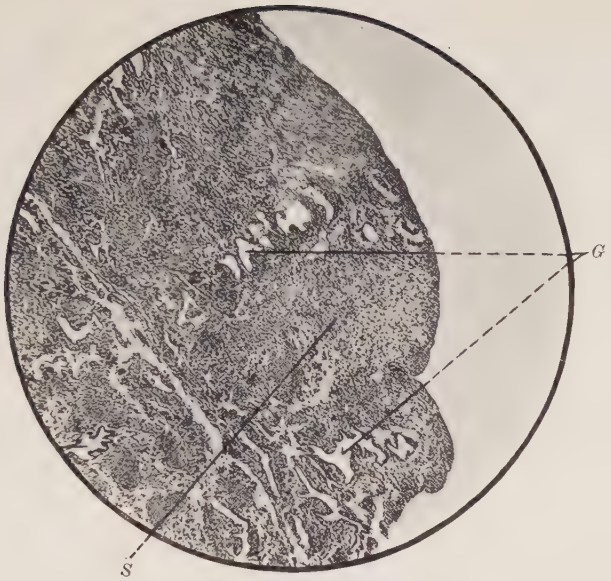

Fig. 152.—Section of a cast from a case of exfoliative dysmenorrhoea. The surface of the uterine cavity is seen to the right. ×50. (*Photomicrograph.*)

S. Dense stroma. *G.* Crumpled remains of uterine glands.

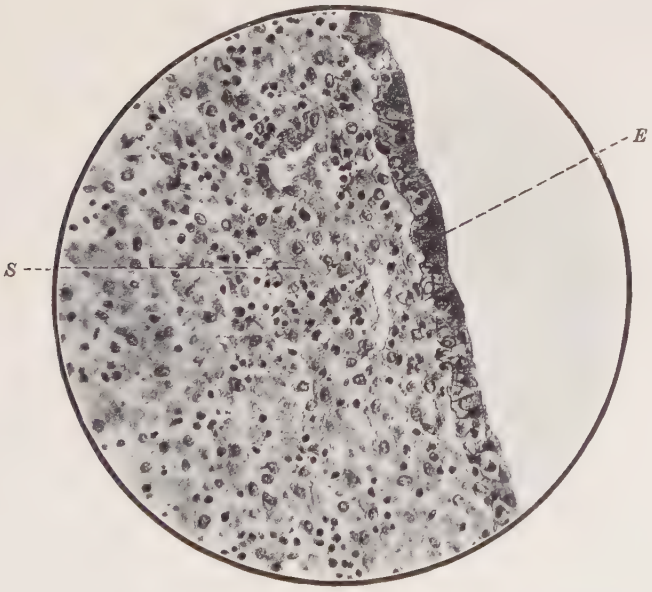

Fig. 153.—High power view of a section through a cast from a case of exfoliative dysmenorrhoea. ×300. (*Photomicrograph.*)

E. Low columnar epithelium on the surface of the endometrium. *S.* Stroma cells which have become 'decidual' in type (cf. fig. 66).

The pain is *menstrual* in time only when it is produced by irregular muscular contractions. An example of this is the dysmenorrhoea associated with submucous fibromyomata. There is an attempt on the part of the contracting uterus to expel the growth which interferes with the regularity of muscular contraction. Again the pain may not only be menstrual but *premenstrual*, and even *postmenstrual*. In such cases it is usual to find the results of inflammatory processes in the uterus or appendages, which tend to produce a condensation or fibrosis of the parts concerned—the walls of the uterus are thickened and inelastic and the tunica albuginea of the ovary rendered so tough that the Graafian follicles may be unable to rupture. With the onset of menstruation the congestion which occurs leads to a dull, heavy, throbbing and aching pain in the whole pelvic area, which commences before the discharge actually begins, and though usually relieved with the onset of menstruation may in some cases be increased by irregular uterine contractions. This state of affairs is followed by a heavy, aching postmenstrual pain, which gradually passes away, and leaves the patient 'washed out' as she usually expresses it.

The **treatment** of this class of dysmenorrhoea is often extremely satisfactory if a definite gross pathological lesion can be found and effectually dealt with. Where there is less definite evidence of gross lesion, and the cause appears to be due to old inflammatory processes, the treatment is not so satisfactory.

When the uterus is hard and large ('fibrotic'), curetting or ionization may be advised, but this alone will be useless unless a definite and prolonged course of general and local treatment be also adopted. This local treatment consists in the employment of hot douches (four quarts of saline solution at 112° F.–115° F.) every morning and evening. Various forms of local vaginal medication by means of drugs such as ichthyol and glycerine may be employed. In regard to general treatment, exercises, active and passive, and fresh air are important.

In connexion also with this type of dysmenorrhoea—that caused by local congestion—it is always most essential that the bowels, which are usually constipated, should be kept acting daily. These considerations lead many of the wealthier classes to seek relief afforded by the waters of the various continental spas. For all practical purposes ordinary saline aperients act just as well. If the whole cause of the trouble arise, as is so often the case, from a chronic condition of overloaded sigmoid with faulty expulsive action treatment must be carried out on the lines laid down for chronic constipation (see p. 406). Sometimes when the constipation is of long standing the pampiniform plexus on the left side becomes markedly varicose, and it is quite justifiable in these cases to ligate and excise the affected veins, a simple

method of treatment which is followed by considerable relief in suitable cases.

Than these causal factors of dysmenorrhoea, which have been divided into two main groups, probably no others exist (intermenstrual pain is not strictly speaking dysmenorrhoea), and, by a careful study of each individual case, one can usually discover to which class it belongs, and treat it scientifically. The medical practitioner should set his face steadfastly against all methods of treatment which include the habitual use of alcohol—gin and brandy are the most generally used by women—or such analgesics as phenazone, phenacetin, and the other coal tar compounds, or the still more dangerous preparations of morphia. Not only are drug habits frequently established, but much ill health may be brought about by the use of all these powerful drugs.

Dysmenorrhoea is probably one of the penalties women are paying for the advantages of evolution and civilization, so that it behoves us all the more to use scientific means for dealing with the condition, rather than to be satisfied if we can to some extent relieve the pains without reckoning the cost in other directions.

§ v. OTHER DISORDERS OF MENSTRUATION.

Hystero-epilepsy is not at present a very well defined clinical entity. The term has been employed to cover various grades and forms of epileptic seizures, and to include various hysterical manifestations. Hysteria is such a diffuse disease that it is impossible to discuss the many presentments of it in this place, even though hysterical symptoms as a whole are frequently due to disordered genital metabolism (see p. 396). 'Hystero-epilepsy,' however, is a term which should be confined to those symptoms of an epileptiform nature which arise during the menstrual period only. The attacks vary in different individuals, or in the same individual, from mere giddiness to the most severe and pronounced form of epileptiform seizure. It is always important to make quite sure that the case is not one of ordinary epilepsy in which the attacks are precipitated by the onset of menstruation, for it is well known that in true epilepsy fits are more frequent and severe about the time of the catamenia.

Many of the cases of hystero-epilepsy appear undoubtedly to be due to a deficiency in the calcium content of the blood, and are curable by the administration of calcium lactate administered between and during the menstrual periods.

The more severe forms are very serious, and are often associated with mental deterioration. When these serious cases are *only* precipitated by the catamenia the removal of one ovary or one ovary and the uterus may be justifiable.

It may also be mentioned that hystero-epilepsy is not unusual in girls in whom the development of the Müllerian ducts has been arrested. In these the ovaries are functional, and they experience monthly *molimina* (sensations or general disturbances associated with menstruation). Such cases have been cured by the removal of both ovaries. It is better, however, to try first the effect of removal of one ovary, in order to avoid any risk of melancholia supervening, as sometimes happens when both ovaries are removed.

Vicarious menstruation.—All the writers on gynaecology from Hippocrates to the present generation have observed cases of, and recorded their belief in, vicarious menstruation. Lately, however, it seems to be the fashion to deny the existence of this phenomenon. There are nevertheless many undoubted instances on record of this unusual state of affairs.

Vicarious menstruation consists of periodic haemorrhages from the mucous membranes of the nose, stomach, rectum or bladder. Sometimes there is haemoptysis. These irregular bleedings may occur in the absence—permanent or temporary—of menstruation, or they may accompany that phenomenon. A case was kept under observation in hospital for several months. The patient vomited blood regularly with each menstrual period. Blood examinations showed that in her case there was an unusual degree of disturbance in the calcium metabolism at this time.

In many recorded cases there has been arrested development of the uterus, with functional ovaries.

Painful breasts before and during menstruation are not uncommonly complained of by women, especially by those who have never suckled. As a rule menstruation is delayed; and in one very bad case this function only recurred every 35 days, the pain in the breasts commencing a week before and reaching a maximum just before menstruation began. Sometimes there is a secretion from the mammae at the time the menses should appear.

The best method of treating this condition is by the administration of belladonna and thyroid gland for a week before the symptoms are expected, continuing until menstruation has commenced. Pregnancy and lactation usually cure the trouble.

Excessive follicular haemorrhage. — Very exceptionally the haemorrhage that takes place on the rupture of a Graafian follicle, occurring during menstruation, is excessive. This may give rise to

intense pain and symptoms of an acute 'peritonism.' A haematocele is occasionally formed. In one case death took place from internal haemorrhage as was proved at the post-mortem examination. Such excessive haemorrhage from a follicle has not been recorded apart from menstruation.

§ vi. DISORDERS OF THE MENOPAUSE.

Although the menopause is the natural physiological termination to the activity of the reproductive functions, just as old age is of life in general, yet there are many troublesome symptoms arising in connexion with this process, for the relief of which advice and treatment are often sought. A better knowledge of menstruation is now enabling us to understand and deal with these symptoms which have for long been the bugbear of the medical practitioner and gynaecologist alike. Recent research has taught us that at the cessation of menstruation we find disordered those metabolic relations which combine to produce the function normally. It is, then, an excess in the normal manifestations that is considered pathological, although strictly speaking there should be normally no distressing symptoms at all.

The menopause may be *physiological* or *artificial*. By 'artificial' we mean that which is produced by the removal of essential genital organs. As a rule the artificial menopause is more severe than the physiological, and this is probably due to the sudden onset; for instead of the normal gradual process, which allows of a metabolic readjustment, the patient's economy is suddenly thrown out of gear, and it may be some time before equilibrium is restored—if ever. Although differing in severity the symptoms are strictly speaking the same whether the menopause be artificial or physiological; consequently the subject can be dealt with from a symptomatic and therapeutic point of view under one heading. It is necessary, however, to remember that women vary considerably, some hardly suffering at all, even with an artificial menopause, while others have a long and stormy physiological climacteric.

The chief **symptoms** of the menopause, which have already been mentioned in Chapter III., are sudden and violent '*flushes*' and '*chills*,' in which the patient is subject to rapid vasomotor constriction and dilatation. These are much more pronounced in hot weather. As a rule the patient breaks out into a profuse perspiration as the 'flushing' subsides. In conjunction with these vasomotor symptoms the patient may suffer from *severe headaches, irregular bleedings from the nose, polyuria* and *cardiac distress*.

Another very common set of symptoms is due to *alimentary disturbances.* The trouble may be confined to gastric indigestion, or to diarrhoea and flatulence; or there may be continuous and troublesome peristaltic movements which produce rumblings and gurglings. Further, the *mental condition* of the patient may undergo a complete revolution at this period of life: a woman previously active and excitable may become passive and phlegmatic, and *vice versa.* Sometimes the mental stability of the patient may be entirely upset, but while such an extreme condition is rarely seen there is no doubt that many mental deviations date from this time of life.

The local changes which normally take place have already been dealt with (p. 89); it will be necessary, however, to refer to those local pathological conditions which are directly due to the onset of the physiological menopause. The local trouble for which the patient most frequently seeks advice is *menorrhagia.* This is irregular; that is to say, the patient will perhaps have amenorrhoea for six weeks, two months, or longer, and then she will be suddenly seized with a profuse 'flooding.' Or the menorrhagia may come on without any amenorrhoea at all. *It is always extremely important to examine all women who complain of unusual bleeding about the menopause, in order to exclude the presence of cancer* or other gross pathological lesion. If there be nothing of this sort to be detected, and the bleeding continue to be troublesome, it is advisable to curette the uterus. On examining the strips of endometrium so obtained one may find that the stroma is full of haemorrhages, both recent and old, which are sometimes in the process of organization. Figure 154 is a photomicrograph of such a condition. Recently it has been described as a new variety of 'endometritis' ('haemorrhagic endometritis'), but there is no reason nor justification for such a distinction. The results of curetting are generally very good. The extensive thickening found in the uterine vessels at the menopause has been held responsible for these bleedings. This is, however, too sweeping a statement, since these changes always exist and bleeding is only occasionally seen. (In this connexion see also Fibrosis of the uterus, p. 214.)

If the curetting do not stop the menorrhagia calcium lactate may be administered. This drug probably controls the irregular action of the thyroid gland, which is responsible for the rapid vasomotor changes and the variation in the calcium content of the blood. In very severe cases infundibular extract may be given with considerable benefit.

Another most important trouble which may arise, especially at an artificial menopause, is enlargement of the thyroid gland—sometimes even exophthalmic goitre occurs. These cases in the light of recent researches should be treated with infundibular extract. In regard to

the administration of infundibular (pituitary) extract: it should be given in small doses to commence with (gr. ij per diem) in the form of a powder and the effect on the blood pressure watched. Should this rise from the normal (about 130 mm. of mercury) to 180 mm. the drug must be suspended for a while.

It is important to remember that in regard to the menopause all treatment must be directed to 'tiding over,' and to mitigation only of

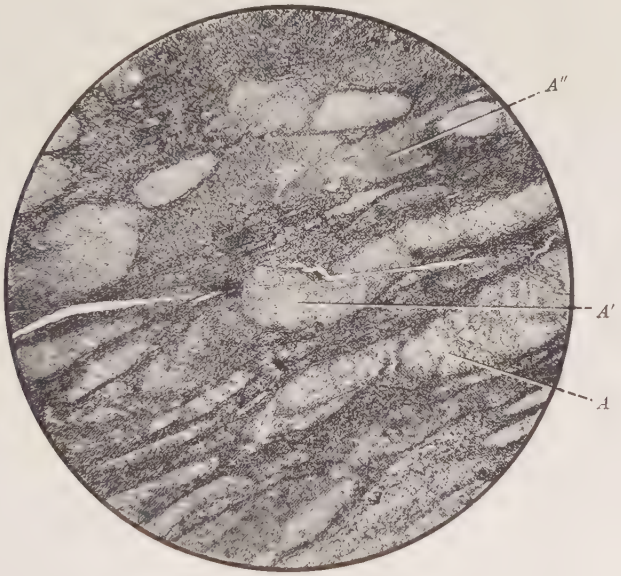

Fig. 154.—Haemorrhages in the endometrium of patient suffering from bleeding at the menopause. × 100. (*Photomicrograph.*)

A. Recent haemorrhage. *A'*. Less recent haemorrhage. *A''*. Old haemorrhage.

the bad symptoms until such time as the metabolism shall have been able to readjust itself. The administration of ovarian extract has been a signal failure, in spite of the theoretical possibilities of such treatment. The general treatment of these patients calls for great care, tact and judgement, since the mind of the patient is in a very impressionable condition. If possible she should be made to take an active interest in all that is going on around her. The practitioner must never consent to the patient making an invalid of herself, or 'lying up,' except, of course, when the menorrhagia is severe, in which case a few days in bed may be necessary. It is extremely common for the better class and well-to-do women to drift into a condition of chronic invalidism at this time of life, and this tendency the practitioner must strenuously check.

It is also necessary to be extremely cautious in prescribing seda-

tives or hypnotics. If the bromides be prescribed it is not long before the patient wants sulphonal, and from sulphonal to morphia is not a big step. Physiological remedies only, such as those mentioned, should be employed.

In addition to the more general disturbances at the menopause the following local pathological lesions may be seen.

Atrophy of the endometrium always occurs at the menopause, but a pathological change known as 'senile endometritis' is sometimes seen. With this condition the woman may have a sanguineous and even purulent discharge. No definite pathological lesion has been detected beyond certain destructive changes in the endometrium, which are probably atrophic in nature. The safest course to pursue is to remove the uterus by vaginal hysterectomy, as there is no doubt that this disease is a precancerous condition.

Arteriosclerosis of the uterine arteries has been recently investigated. It normally occurs at the menopause, and most markedly in women who have had children. It is probably part of the general senile fibrosis of the uterus. Sometimes bleeding is very severe, and in these cases it is occasionally necessary to remove the uterus by vaginal hysterectomy.

Excessive fibrosis of the uterine wall.—As already indicated, at the menopause fibrosis of the muscular tissue occurs as a normal process; but if the muscle fibres be not healthy an excessive fibrosis supervenes (see p. 265). This condition may, like arteriosclerosis to which it is allied, be associated with menorrhagia and metrostaxis.

Kraurosis vulvae.—At the menopause there is atrophy not only of the essential genital organs—the uterus, Fallopian tubes and ovaries—but also of the vagina and external genitals. The labia shrink, and the sebaceous and sweat glands tend to disappear. The skin surfaces become hard and inelastic, the epithelial covering less thick and the subjacent papillae atrophied. In most cases the vaginal orifice becomes contracted and rigid, and this may lead to dyspareunia or mechanical difficulty during coitus.

But superadded to these normal menopausal changes there may be a further degree of atrophy, which is directly or indirectly associated with the condition known as *kraurosis vulvae*. This morbid process affects only the labia minora, vestibule and orifice of the vagina.

In appearance the diseased parts are at first shining and red, with patches of deeper colouration; later they become yellow, and contracted to a remarkable degree. The patient suffers from great pain whenever the parts are touched, a state of affairs that gives rise to intense dyspareunia. Sometimes there is also great discomfort on walking, from the friction of the contiguous surfaces or of the clothes.

We find on microscopical section (fig. 155) that the surface is covered by a very thin layer of epithelium, the papillae are atrophied to a marked extent, and in the subepithelial connective tissue there

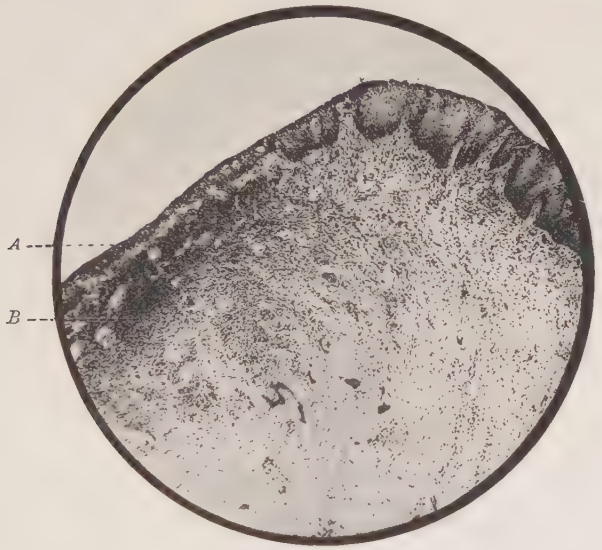

Fig. 155.—Kraurosis vulvae. (*Photomicrograph by Berkeley and Bonney.*)

A. The epithelium reduced to a layer a few cells deep. *B*. Extensive plasma cell proliferation in the subepithelial tissue.

In the section many polynuclear leucocytes are to be seen in the subepithelial tissues and among the epidermal cells.

are collections of plasma cells together with many lymphocytes and polymorphonuclear leucocytes.

There is no doubt that kraurosis vulvae is a condition associated with the menopause—postoperative or normal, although some observers state that they have seen the disease in young and sexually active women.

The only treatment of any avail is removal of the diseased areas.

CHAPTER IX.

DISORDERS OF THE NORMAL PHYSIOLOGICAL CONDITIONS IN RELATION TO CONCEPTION.

§ i. STERILITY.

The normal physiological processes which ensure impregnation and fertilization of the ovum may be interfered with in many ways, each of which, or several acting in conjunction, may produce sterility; this means that the process of conception is prevented. The term, 'sterility,' however, has often been wrongly used to include all the possible conditions under which the procreation of a viable child is rendered impossible. It should be confined to that state of affairs which results from interference with the process of fertilization only. Those causes which interfere with conception after fertilization has occurred will be dealt with separately.

Sterility may be *permanent* or *temporary*. That is to say conditions may exist which render fertilization absolutely impossible at any time for the woman in question; or they may be temporary, in which case circumstances may arise to remove the disability.

PERMANENT STERILITY, which is absolute and incurable, is due to local causes only; these, however, may be secondary to disease elsewhere, such as the **secondary infantilism** which is associated with pituitary (hypophysial) disease. We may find, then, **absence of genital organs**, congenital and postoperative; **genital malformations**; **infantilism**; **superinvolution**; or **extensive disease of the ovaries, Fallopian tubes or uterus.**

TEMPORARY STERILITY, which is relative and possibly curable, is due to both *general* and *local* causes.

General causes are (1) **Intrinsic selective reasons inherent in the ova or spermatozoa.**—In this class of case we find that the marriage of near relations (first cousins) is a frequent cause of fertilizative incompatibility. Also any great difference in the ages of the married couple tends to produce sterility. It has frequently been noted that a woman sterile with one husband is fertile with another. Further, as the age of the woman progresses she becomes less fertile, as does the male in a lesser degree. In this class, then, we may have incompatibility between the man and woman, relative sterility on the part of the woman, or sterility on the part of the husband.

(2) **General disturbances of metabolism** which cause *malnutrition*, *obesity* and *chlorosis* are often associated with sterility, but all may be curable if treated on general principles. Again, *myxoedema* so long as it is untreated is always associated with sterility. In this class must also be included those cases of sterility attributed to climate, temperature and so on, cases which possibly show some reversion to the seasonal fertility of the lower animals.

Local causes leading to temporary sterility in the female are the following: *elongated* and *conical cervices, with pin-hole os uteri; inability to retain the semen; acute congenital flexions* of the uterus, which are usually associated with an imperfectly developed organ; *atresiae* of the genital passages; *slight infective conditions* of the uterus, Fallopian tubes or ovaries; *adenomatous endometrium; prolapsed ovaries; vaginismus* and any other conditions leading to *dyspareunia* (*vide infra*); and *local discharges* which destroy the vitality of the spermatozoa.

In considering the question of sterility in a woman we must not forget that in about ten per cent. of all cases of infertile unions the man is the sterile partner—that there is either some impairment in the vitality of his spermatozoa or he is impotent.

Of the conditions causing sterility in the woman it has already been mentioned that some cause absolute and incurable sterility. Of these, the commonest condition that we are called upon to deal with (ineffectually, so far as the question of sterility is concerned) is that arising from extensive gonorrhoeal infection. There is no other causal factor that plays so large a part in the production of sterility in women as gonorrhoea, for this disease reaches the tubes and causes destruction of the lining membrane in a large number of the patients affected.

In cases of curable or relative sterility treatment is often difficult, indeed impossible. Modern civilization does not sanction the customs of the ancient Romans, who encouraged the advent of more fertile and

promising mates for their wives than they had proved to be; or of the Eskimos, who even now interchange their wives as a mark of friendship. Incompatibility in the matter of fertilization is therefore a problem for the eugenist rather than the gynaecologist. General disturbances of metabolism or unhygienic conditions must be treated on ordinary medical lines, and need no special comment here. It is, however, with the curable local conditions that as gynaecologists and practitioners we are chiefly concerned.

In young married people dyspareunia due to various causes will claim a large share of our attention. Or, again, conical cervices and badly developed flexed uteri may require careful surgical treatment on the lines described under the diseases in question. So, too, any other local disease or deformity that can be detected must be carefully treated. At the same time a very guarded prognosis should be given, for there is not the least doubt that commonly more than one factor is at work, and that amputation of a hypertrophied cervix will still prove ineffectual treatment if the husband be impotent, or sexual incompatibility obtain.

§ ii. DYSPAREUNIA.

'Dyspareunia' is the term given to painful sexual intercourse. Most women suffer some pain at the commencement of married life. This varies in severity in different women according to their temperament and nervous stability, or to local conditions. In the first place nervousness plays a large part in the production of dyspareunia by leading to more or less involuntary resistance to connexion. In the second place, however, the local conditions may be such as to lead to some difficulty by reason of the pain occasioned. The orifice to the vagina, or that through the hymen, may be small, or the hymen very resistant; or there may be great disproportion between the size of the male organ and the *ostium vaginae*. These are all circumstances which time will usually rectify after the first difficulties have been overcome, and one is rarely consulted on the question of dyspareunia until many months have elapsed and both husband and wife are convinced that 'something is wrong.' So that if a practitioner be consulted by a woman who has been married some months, and who still cannot tolerate sexual intercourse, he may conclude that the time has come for some investigation and possibly interference; at the same time, unless he be convinced that a fair trial has been given to the natural course of events he should counsel delay, in the hope that time and perseverance will bring about a normal state of affairs.

In young married women, apart from the natural factors alluded to above, the commonest causes in the order of frequency are:

Vaginismus.
Tender carunculae myrtiformes, either alone or associated with vaginismus.
Prolapsed ovaries.
Defective development of the vagina or resistant hymen.
Growths or inflammatory conditions of the vagina and vulva.

Vaginismus is due to spasm of the sphincter muscles of the *ostium vaginae*. This may be a pure neurosis from fear on the part of the patient, or may be a reflex action due to pain arising from any of the local conditions mentioned.

The **treatment** of vaginismus is rarely satisfactorily conducted on general lines, such as separation from the husband, rest cures and the like. Local treatment is nearly always indicated. If the condition be one of nervous spasm pure and simple it is well to adopt some form of local treatment at once. Remedies such as cocaine ointment are, however, of no value; indeed, when local anaesthetics have been used, husbands have been known to complain bitterly that it was not only the wife on whom the effect was produced! The best treatment in mild cases is the use of the vaginal dilator (fig. 156), which should be worn for a few hours a day or at night. In the worst cases the patient should be anaesthetized, and the vaginal orifice thoroughly stretched or the sphincter divided with a scalpel. The stretching is always worth a trial, *but it must be done thoroughly;* it has the advantage over section of the sphincter that intercourse can, and should, be indulged in as soon as possible afterwards.

Fig. 156.—Vaginal dilator.

The treatment of dyspareunia due to local pathological conditions resolves itself into the treatment of these conditions, which will now be briefly discussed.

If there be **tender carunculae myrtiformes** or a **resistant hymen** the patient should be anaesthetized, and the offending structure clipped off, back to the vaginal orifice proper; as a rule it is wise to take the opportunity of thoroughly stretching this opening at the same time. A **defective vagina** is a matter which requires careful consideration, and each case must be judged on its own merits; any operative procedures which could be carried out would have to be planned to meet the particular case, and cannot therefore be adequately discussed here.

Prolapsed ovaries occasionally require operative procedures, and these will be dealt with elsewhere (see p. 465). Other local conditions such as **inflammatory affections** or **growths** must also be treated on the lines to be described under the respective diseases.

But it is not only the young newly-married woman who seeks advice on account of dyspareunia. The patient may have been married many years, and even have had children, without previously suffering from pain on connexion. It is most important to examine these cases carefully, for we must expect to find some definite disease in the vulva, vagina or pelvic organs. In regard to the vulva it is not uncommon to see dyspareunia caused by vulvitis, often due to gonorrhoea, and associated with oedema of the labia. In the pelvis **retroflexions** of the uterus, with or without prolapsed ovaries, are a frequent source of pain during coitus. In such cases examination and palpation of the fundus uteri will be found to give rise to pain. Or there may be salpingitis with pelvic peritonitis, a condition which is often exquisitely sensitive and tender to the touch. Such conditions as cancer of the cervix or growths of the uterus or ovaries do not usually give rise to dyspareunia, although they may do so.

These local diseases demand treatment, and will always, even if dyspareunia be the only symptom. It is one to which practitioners do not at times attach due importance, yet it is one which should always be enquired into if there be any indication that such a state of affairs is likely to exist, for many a home is rendered miserable, perhaps wrecked, by the existence of strained or impossible sexual felicity; and all the more is it necessary to use tact and initiative, since too frequently advice is not sought owing to instincts of modesty.

There is still one more class of patient who suffers from dyspareunia, and who occasionally seeks advice: the woman past the menopause, whose **atrophied vagina and outlet** offer a barrier to easy and painless intercourse. Or there may be present the atrophic condition known as kraurosis vulvae, which causes the orifice of the vagina to become shrunken, rigid and exquisitely tender, as has already been described. The treatment of this form of dyspareunia, as such, is a question for the patient herself.

§ iii. ABORTION.

Strictly speaking abortion belongs to the province of obstetrics, but it is necessary to deal with it shortly here because many gynaecological conditions depend for their origin on an abortion, and *vice versa*. Abortion is the term applied to the termination of early pregnancy,

before the age of viability is reached. The causes producing abortion may be divided into the following groups:

A. Maternal.

(1) **General causes**, whether associated with pregnancy, such as *eclampsia*; or independent of it, such as *syphilis*, *fevers*, and *abortifacients* (lead, ergot, etc.). *Mental disturbances*, such as fright and shock not uncommonly lead to abortion.

(2) **Local causes**: *malformations, derangements of the normal position* of the uterus, or *disease of the uterus* or *appendages* acting directly or indirectly.

B. Abnormal conditions affecting the ovum.

(1) *Degenerations and diseases of the placenta or membranes.*

(2) *Diseases producing death of the foetus*—generally toxaemias or infections from the maternal blood.

C. Direct stimulation of or **injury to the uterus or its contents.**

D. Little understood causes producing 'habitual abortion.' These will probably be eventually placed in groups A and B.

Now it is obvious that in the above groups there are many subdivisions, and that most of the cases fall into the province of the obstetrician, so that only those which more nearly concern the gynaecologist will be considered here.

The class of case, then, with which the gynaecologist is concerned is that in which the abortion is due to local conditions. These conditions are included in group A, subdivision (2), and in group C.

As a rule the practitioner is consulted because of repeated abortion, and it will be worth while, therefore, to enquire more closely into the commoner types of local pelvic disease which lead to early expulsion of the ovum.

Malformations of the uterus, such as bicornuate uterus or imperfect development of the uterine body, when present are frequently incompatible with the growth of the ovum. At the same time full term pregnancy does occur in bicornuate uteri. In some cases the pregnancy in a uterine horn may present all the symptoms of a tubal pregnancy, and even rupture, causing urgent symptoms which may demand immediate operation.

Of the anatomical derangements of the uterus causing abortion, *retroflexion*, with or without retroversion, is the commonest, and cases of repeated abortion from this cause are frequently met with. The abortion usually occurs about the eighth week of pregnancy.

Of *diseases of the uterus* leading to abortion, one which occupies a large share of attention at the present time is fibromyomatous disease

of the uterine wall. Frequently women with fibromyomatous uteri are sterile; sometimes, however, a woman may not only become pregnant but go to full term. These circumstances depend to a great extent on the size and position of the fibromyomata. It is quite common to observe abortion if a woman with a fibromyomatous uterus become pregnant. This occurs for several reasons: either the uterus cannot expand properly because of the disposition of the growths, or the placental attachment is inefficient and the blood supply inadequate; or again the uterus which contains fibromyomata may be continually undergoing contractions which eventually lead to the expulsion of the ovum. This subject will be more fully discussed under fibromyomata uteri (see p. 317).

Other growths of the uterine wall may in the same way lead to abortion. Diseases of the cervix alone, such as carcinoma, while usually producing sterility rarely interfere with the progress of pregnancy, should that occur. 'Endometritis' is also the indefinite causation assigned to many cases of abortion. But this term has come to be used in such a wide sense that it is necessary to be careful in making use of such generalizations. 'Endometritis' so-called, indicating a hypertrophic or hyperplasic condition of the endometrium, probably is a common cause of imperfect implantation and early abortion; while the true endometritis of inflammatory origin is probably sufficient to prevent implantation, and to produce sterility.

In regard to *diseases of the appendages*: tumours of the ovary may press on and interfere with the expansion of the uterus, and in this way mechanically interrupt pregnancy. So, too, extensive inflammatory adhesions to the uterus may prevent the normal enlargement of that organ.

From experiments upon animals it has been thought that removal of ovaries, or destruction of the corpus luteum, inevitably leads to abortion in the early stages of pregnancy, but there is sufficient evidence to show that a woman's ovaries may be removed as early as the sixth week without causing abortion. Such a surgical procedure is, however, rarely necessary.

Direct injuries to the uterus and its contents are generally caused by attempts to procure abortion, and come into the hands of the practitioner because of injury to the uterus, bleeding from retained products of conception, or sepsis. The disturbance produced by a kick on the abdomen or by a fall may also produce abortion. Similarly, stimulation of the uterus followed by abortion may result from hot douching or excessive venery.

The **diagnosis** of threatened abortion is usually easy. The history of amenorrhoea with the sudden onset of pain and bleeding clearly

indicate an impending termination of the pregnant condition. A bimanual examination must be made to exclude the presence of an ectopic pregnancy. A uterine polypus, while producing the pain and bleeding, is not associated with amenorrhoea.

It is not always an easy matter to decide when an abortion is inevitable, but the main guides are the presence of recurring pains (uterine contractions), bleeding and a dilated os uteri: any two of these symptoms together usually indicate that an abortion will take place sooner or later.

When an abortion has occurred the foetus and placenta, or the entire ovum with the membranes, may be recognized. It is important to identify the early ovum. This can be done, if it be floated in water, by the shaggy chorionic coat (fig. 157). Microscopically also the chorionic villi may be seen (fig. 160). Sometimes the early ovum is expelled enclosed in the decidual membrane (fig. 158) which on naked-eye inspection is seen to be rough externally and smooth internally, while on microscopical examination the decidual cells may be recognized (fig. 159).

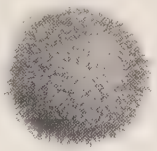

Fig. 157.—Early ovum in its shaggy chorionic coat. (*Natural size.*)

Fig. 158.—A decidual cast, containing an ovum, expelled from the uterus in early pregnancy. A window has been cut to show the smooth lining of the cavity. (*Natural size.*)

The **treatment of abortion** is to a great extent expectant. In the majority of cases no interference is necessary; indeed it is inadvisable. Great care must be taken that no infection be carried from the outside to the uterus, and all examinations should be made with the hand enclosed in a sterilized rubber glove, after the vulva has been well washed with an antiseptic lotion.

Sometimes, although the abortion may not appear to be inevitable, it is necessary to empty the uterus owing to a rise of temperature, or other signs of infection; or because the bleeding is continuous and severe. In these circumstances the uterus may be emptied rapidly, after dilatation of the cervix by means of Hegar's dilators (see p. 499), or by division of the anterior wall of the cervix if the contents of the uterus be not infected (see p. 502). Some authorities still use, and advise the use of tents for the dilatation of the cervix, but it is too difficult to render them sterile to admit of

their use outside a hospital. If the haemorrhage be severe, packing may be resorted to. Before this is done the vagina must be thoroughly cleaned out with antiseptic lotion and the vulva cleansed. A Sims' speculum is then passed into the vagina, and the anterior lip of the cervix seized with a volsellum and drawn down. A long narrow strip of plain sterilized gauze, or iodoform gauze, is pushed through the cervix and into the uterus with a probe; the cervix itself, the vaginal fornices and upper part of the vagina are then tightly packed. The lower part of the vagina is loosely packed in order to avoid causing pain to the patient, or difficulty in micturition by pressure on the urethra.

The effect of the packing is to cause dilatation of the cervix, and uterine contractions which lead to the expulsion of the contents of the pregnant organ.

INCOMPLETE ABORTION.—When any of the products of conception are retained the patient suffers from haemorrhage, and sometimes also from sepsis. The proper treatment is to dilate the cervix, and with the finger or a blunt curette to remove anything that can be felt. Great care must be taken not to perforate the uterine wall (see p. 140). The uterus is afterwards flushed out with an antiseptic solution (tinct. iodi ʒij, aqua Oj makes an excellent lotion). Finally the uterus is packed with gauze for twenty-four hours. Ergot or infundibular extract may be given to ensure proper involution. Septic conditions following abortion and injuries to the mother are dealt with in the appropriate chapters.

If there be any doubt as to whether or not an abortion have occurred, and the foetus be not found, any debris that is passed or obtained from the uterus should be subjected to a microscopical examination, and decidual cells (fig. 159) and chorionic villi (fig. 160) searched for. Such an examination may be of great medico-legal value, to the possibilities of which the practitioner should always be alive. Sometimes, however, the medical man is not consulted until some time has elapsed since the abortion occurred. If the uterus be found enlarged care must be taken not to mistake this enlargement for simple subinvolution. On dilatation and curettement of the uterus, which should be carried out, a small piece of placenta covered with a fibrinous deposit is often found, forming what is known as a placental polyp. In these cases the bleeding is more or less continuous and severe, and the patient may suffer from uterine colic. There is rarely any acute septic infection in such circumstances.

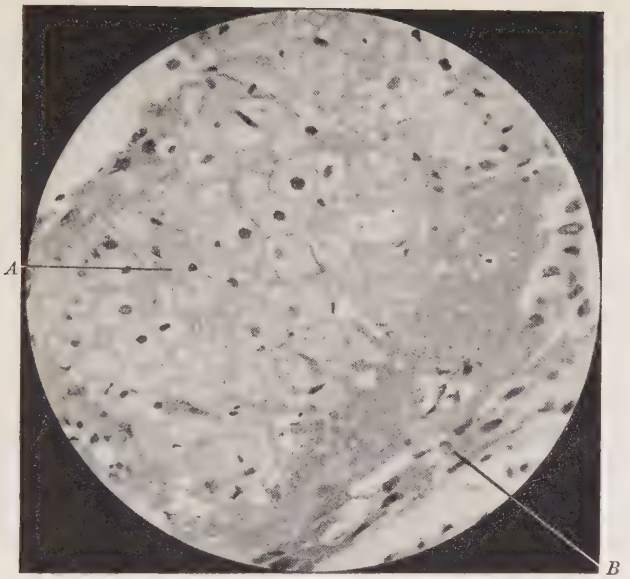

Fig. 159.—Decidual cells in early pregnancy. ×200. (*Photomicrograph. J. Macgregor, 'Study of the Endometrium.'*)

A. Vesicular type. *B*. Fusiform (? compressed) type.

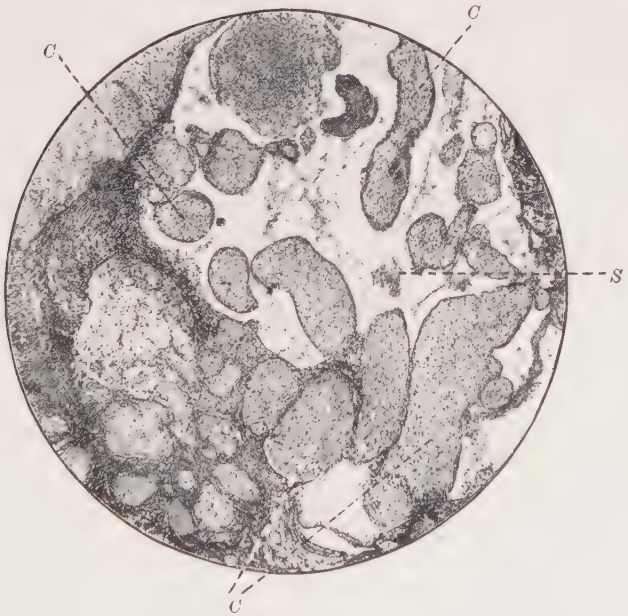

Fig. 160.—Placental remains, removed from the uterus by curetting. ×100. (*Photomicrograph.*)

C. Chorionic villi still covered by Langhans' layer of cells, and in places by syncytium.
S. An isolated piece of syncytium.

§ iv. SUBINVOLUTION.

By 'subinvolution' we mean that the uterus has not returned to the normal size after labour or abortion has terminated a pregnancy. Involution is brought about physiologically in two ways: (1) by a process of absorption of hypertrophied muscle protoplasm (*i.e.* atrophy), said by some to be of the nature of autolysis of the muscle fibres; and (2) by contraction and retraction of the muscle fibres themselves. Contraction is caused by chemical stimuli circulating in the blood. Retraction is an indefinite term: probably most authorities refer to the elasticity of the muscle fibres, which shorten, without losing the power of contraction, after the uterus is emptied.

It is necessary to have some idea as to the progress of normal involution before attempting to study the abnormal. Immediately after delivery the uterine cavity is about $6\frac{1}{2}$ inches in length; at the end of a week it is about $4\frac{1}{2}$; and in many cases at the end of fourteen days it is either normal in size ($2\frac{3}{4}$ inches), or between this and $3\frac{1}{2}$ inches. If therefore the uterus were found at the end of six weeks to measure $3\frac{1}{2}$ inches or more a definite degree of subinvolution would be present. It is rare for simple subinvolution to be noticed earlier than this, unless there be a continuous bloody discharge.

Subinvolution is due to *general* or *local* causes.

General causes are *acute fevers* or *septic toxaemias; deficiency in the maternal blood of the substances causing uterine contractions, notably calcium salts* (hence the absence of milk in the breasts, which may also be due to calcium deficiency in the blood, is frequently associated with subinvolution); and lastly any *debilitating disease*, such as tuberculosis, which may also produce this effect by lowering the calcium content of the blood.

Local causes.—The *retention of the products of conception*, and *acute anteflexion* and *retroflexion*, with retention of the uterine discharges, are probably the commonest of the local causes of subinvolution. But in addition to these, any *inflammatory disease* of, or *growths in the muscular wall of the uterus* may lead to imperfect contraction and retraction. *Inflammatory lesions in the neighbourhood of the uterus*, whether directly associated with the pregnancy or not, may also prevent the normal process of involution. So, too, *sepsis*, with venous thrombosis, may cause a uterus to maintain the postpartum size ($6\frac{1}{2}$ inches) for many weeks. Further, *over-stretching of the uterine muscle* fibres, such as occurs with hydramnios and vesicular mole, may be detrimental to proper involution.

The **treatment** of subinvolution consists of removal of the cause.

In regard to the general causes it is quite common, as already stated, to see subinvolution as the result of calcium deficiency. This may be detected after labour by the protracted colouration of the lochia, which do not stop at the usual time (ten days). This continuation of the lochia without pain or offensive discharge is usually indication of defective involution of a simple character, and is readily amenable to treatment with calcium lactate (gr. xxx—ʒj omne nocte) and hot douches; or with ergot or infundibular extract and electrical stimulation when the degree of subinvolution is great. Other general conditions must be treated on ordinary lines.

Of local causes the retention of products of conception is the most common. This is usually indicated by haemorrhage, or offensive discharge, or both together. The uterus should be dilated at the earliest moment, and the contents removed by the finger or a blunt curette; after which, if not already infected, the uterus will soon return to the normal size. If there be pelvic adhesions causing subinvolution these must be dealt with by abdominal section.

§ v. SUPERINVOLUTION.

'Superinvolution,' which is somewhat rare, is an excessive involution following full time parturition, or occasionally an abortion. Superinvolution may occur at any age during the child-bearing period. The condition appears to be one of primary atrophy of the uterus. The sound usually passes to a depth of about $1\frac{1}{2}$ inches. The condition of the ovaries has not up to the present time been adequately studied; it is said that no primary change can be found in them. The pathology and etiology is therefore somewhat obscure. An extraordinary coincidence or association, which obtained in four cases seen by the author, has been observed in regard to superinvolution, namely that a 'flooding' has followed delivery, and that the subsequent discharge has remained blood-stained rather longer than usual. Excessive lactation has also been mentioned as an etiological factor in the condition.

The **symptoms** complained of are amenorrhoea, general debility and slight menopausal symptoms.

Treatment.—Until we know more of the etiology and pathology we cannot expect to treat superinvolution with any chance of success. In the present state of our knowledge the lines of treatment which seem to offer the best prospect of success are local electrical stimulation, and the administration of thyroid gland. It is very important to recognize the condition, since the prognosis in regard to the re-establishment of menstruation is bad.

§ vi. OEDEMA OF THE VULVA, AND VARICOSE VEINS OF THE VULVA.

The uterus in pregnancy sometimes presses unduly upon the pelvic veins, interfering with the circulation in the haemorrhoidal and vesical plexuses without obstructing the flow of blood in the vena cava or in the external iliac veins. When this occurs the patient is apt to suffer from oedema of the vulva, or varicose vulval and haemorrhoidal veins. These conditions may occur separately or together. It is important to attend to them as soon as possible, otherwise they may lead to serious trouble during parturition.

Treatment consists of placing the patient at rest in bed or on a couch, the feet of which are raised as high as is compatible with comfort. If the pregnancy be not far advanced retroflexion of a gravid uterus should be suspected, and appropriate measures taken to rectify the malposition when present. If the veins of the labia majora remain varicose after pregnancy and cause trouble, such as pruritus vulvae, they should be excised.

§ vii. ECTOPIC (EXTRAUTERINE) PREGNANCY.

It has recently been definitely and conclusively shown that ectopic pregnancy—that is to say, primary implantation and growth of the fertilized ovum in other sites than the uterine cavity—may occur not only in any part of the Fallopian tube, but also in the abdominal cavity and in the ovary (fig. 161). Further, pregnancy in a badly developed uterine cornu must, for clinical purposes, be considered ectopic.

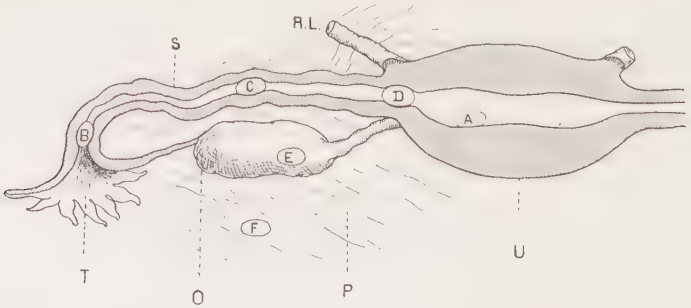

Fig. 161.—Diagram to illustrate the various sites at which implantation of the ovum may occur, in their order of frequency.

A. Normal—posterior wall of the uterus. *B*. In the ampulla. *C*. In the isthmus. *D*. Intramural. *E*. Ovarian. *F*. Peritoneal. *U*. Uterus. *P*. Peritoneum. *O*. Ovary. *T*. Fimbriated extremity of the Fallopian tube. *S*. Fallopian tube. *R.L*. Round ligament.

ABDOMINAL PREGNANCY. — *Primary abdominal pregnancy* is extremely rare, but has occurred as the result of the implantation of the fertilized ovum on the peritoneum. The cases so far recorded have called for operation on account of severe internal bleeding. *Secondary abdominal pregnancy* sometimes occurs as a sequel to tubal or ovarian abortion or rupture. The original placental site may be undisturbed, or much more rarely the ovum may obtain an attachment in the peritoneal cavity and establish a connexion with the maternal circulation. The foetus may go to full term in either of these circumstances.

OVARIAN PREGNANCY is likewise very rare although well authenticated, and results from the fertilization of an ovum in, or just outside a Graafian follicle. Early determination of the pregnancy, with haemorrhage, always occurs.

Since ovarian and abdominal pregnancies are so rare they need not be mentioned further than to say that the clinical signs calling for interference are the same as those which present themselves in the rupture or abortion of a tubal pregnancy—severe abdominal pain and bleeding.

TUBAL PREGNANCY may occur in any part of the tube—in the ampulla (the most frequent position), the isthmus or the interstitial portion (fig. 161). Formerly it was supposed that inflammatory diseases of the tubes were the cause of tubal pregnancies, but it is now thought that the condition is more or less accidental, and depends upon the situation of the ovum at that stage of development when the trophoblast is capable of producing implantation. The anatomical features of an ovum implanted in the tube or elsewhere are very similar to those found in normal uterine implantation (see p. 79); that is to say there is an invasion by the trophoblast of the tissues in which the ovum is implanted As, however, there is only slight, if any, decidual reaction in the tubal pregnancies, and probably no equivalent reaction in the ovarian and abdominal, it follows that the eroding effects of the trophoblast produce serious consequences at an early stage.

The symptoms, signs and course of tubal pregnancy may be conveniently divided into the state of affairs before termination of the pregnancy and that obtaining after. It is somewhat rare for the patient to be lucky enough to have her condition diagnosed before the onset of the serious symptoms that may be seen in the later stages.

Symptoms and **physical signs.**—In the early stages, before determination of the pregnancy, the symptoms consist of abdominal pain on the side on which the pregnancy is situated. The pain is of a sharp and cutting character, and is occasional. It is probably due to

the small subchorionic haemorrhages which take place from time to time at the site of implantation, and eventually bring about the condition known as a tubal mole. Sometimes there is frequency of micturition, and there may be the general early symptoms of pregnancy.

On being questioned the patient frequently states that she has "just gone over the time" by a few days; on the other hand she may have missed no menstrual period at all. At times the patient tells us that there have been several years of sterility since her last child; but on the other hand the condition may be found in primigravidae, married and unmarried; the last circumstance may greatly increase the difficulties of diagnosis.

The abdomen is moderately tender on palpation, and sometimes rigid. On bimanual examination the affected tube is found to be enlarged and tender, and it is sometimes prolapsed into the pouch of Douglas. Great gentleness should be employed in handling distended tubes, lest they be ruptured. The uterus, too, may be felt to be slightly enlarged.

Unfortunately, however, more serious symptoms have usually set in before the case comes under notice, and rupture of the tube or abortion is in progress, or has occurred.

Rupture of the tube is of comparative rarity. Spontaneous rupture, however, may be brought about or influenced by two factors, namely the thinning of the tube wall by the trophoblast, which does not confine itself to the mucous membrane but invades the surrounding muscle fibres; and the gradual distension and thinning of the tube with the increasing size of the products of conception as well as with small and repeated haemorrhages. As the condition of the tube becomes more precarious Nature tries to limit the danger incurred through the destructive processes by the formation of peritoneal adhesions to, and the deposition of lymph on the affected tube. Some violent exertion is often noted in the history of a tubal rupture as the final precipitating factor in the disaster. In rupture of the tube if the ovum be situated in the ampulla the contents are shed, entirely or partially, into the peritoneal cavity, and when this occurs a false gestation sac is sometimes formed round the foetus, which may continue to grow, supplied with blood from the new attachments. In this way the foetus may go to full term and die, or it may die before that time. Lithopaedions, or the remains of ectopic gestations which have survived rupture or abortion and have undergone calcification, are sometimes removed many years later.

If the pregnancy be situated in the isthmus or intramural portion of the tube, rupture may either occur into the peritoneal cavity or into

the broad ligament. In some rare cases an intramural pregnancy ruptures into the uterus. The symptoms which attract attention are violent pain, and collapse, with all the signs of internal haemorrhage which will be alluded to again directly. When the rupture takes place into the uterus the signs may be simply those of abortion, and the true character of the pregnancy may remain unrecognized. If it be the extraperitoneal space, between the layers of the broad ligament, which is invaded by the haemorrhage and products of conception from the tube, a large semisolid swelling can be located by bimanual palpation in this situation. Further, if a finger be inserted into the rectum it will pass behind the swelling, which pushes the uterus over to the opposite side. In these circumstances the pain will be less severe and the haemorrhage less profuse, owing to the resistance of the limiting peritoneal layers; but the sudden and violent onset, and the character of the contents of the tumour felt—at first fluid and later semisolid—should give one a fair idea as to the nature of the trouble.

Very rarely the posterior layer of the broad ligament gives way, and the blood and foetus escape secondarily into the peritoneal cavity, producing a haematocele, or perhaps a secondary abdominal pregnancy.

Tubal abortion is the common method of termination in tubal pregnancy. In figure 162 is seen a tubal contents in the process of

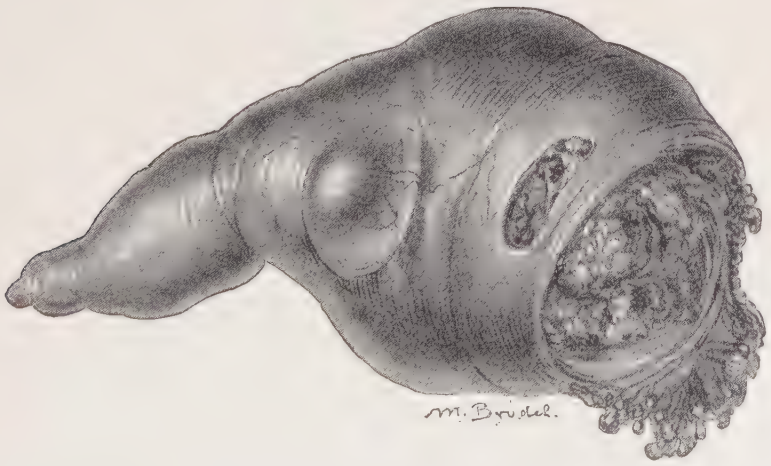

Fig. 162.—Extrauterine pregnancy; tubal abortion. (*Natural size.*) (*From Kelly's 'Operative Gynaecology,' by permission of the author, and publishers, Messrs. Appleton & Co.*)

extrusion through the abdominal ostium. Before abortion occurs it is usual for the tubal pregnancy to be converted into a tubal mole. This is the result of haemorrhage from the eroded maternal blood

vessels (some authorities think it is from the foetal circulation) which entirely separates the ovum from its attachments, and leads to its death. A macroscopical section of the tubal mole *in situ* is seen in figure 163. Figures 164 A and B are photomicrographs of a tubal mole, and

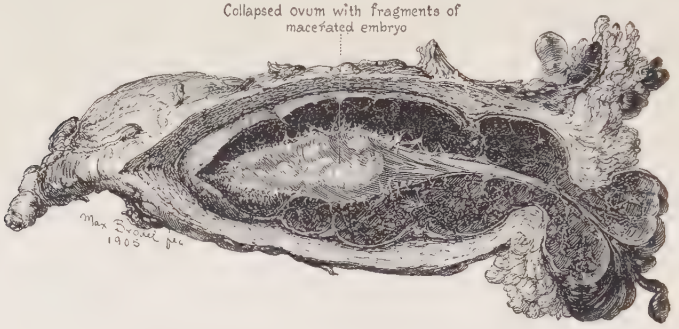

Fig. 163.—Section through the Fallopian tube showing tubal mole and ovum *in situ*. (*From Kelly's 'Operative Gynaecology,' by permission of the author, and publishers, Messrs. Appleton & Co.*)

illustrate the presence of chorionic villi in the blood clot, whereby a tubal pregnancy may be verified. From a consideration of the above facts it will be obvious that secondary abdominal pregnancies do not often follow tubal abortion.

There is another point of considerable importance. It has already been mentioned that in all cases of ectopic pregnancy the uterus enlarges. This is due to the decidual reaction which occurs in the endometrium, a reaction which may to some extent be responsible for the cessation of menstruation commonly, but not always, observed in these cases. This reaction leads to the formation of a distinct decidual membranous lining to the uterus. Figure 165 gives a macroscopical view of a decidual membrane from the uterus in a case of tubal pregnancy. It will be seen that, like the decidual membrane of normal pregnancy, this cast is rough on the outside and smooth in the interior. In a microscopical section of such a membrane large decidual cells may be seen. Now when abortion or rupture occurs, with the termination of the pregnancy and the death of the foetus, the decidual membrane becomes separated by uterine haemorrhage, and is sooner or later expelled from the uterus. Uterine haemorrhage is, therefore, a concomitant sign of the rupture or abortion of an ectopic pregnancy.

Diagnosis.—The immediate essential diagnostic signs, then, of a rupture or abortion into the peritoneal cavity are severe pain, a small rapid pulse, pallor, breathlessness (air hunger), and a subnormal temperature—all due to the internal haemorrhage. Locally the abdomen is rigid and tender, and free fluid (blood) may sometimes be

Fig. 164 A.—Tubal mole. Section showing the wall of the expanded tube (*W*), the remains of folds of mucous membrane (*M*), and the contained blood clot (*B*), in which are seen chorionic villi (*C*). ×20. (*Photomicrograph.*)

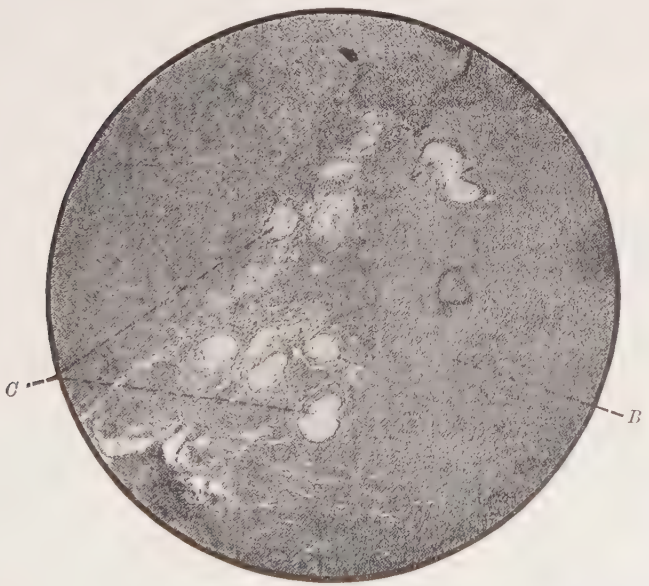

Fig. 164 B.—Group of chorionic villi (*C*) in blood clot (*B*) from a tubal mole. The villi are the same as those seen in the low power illustration (A) of the same section. ×100. (*Photomicrograph.*)

detected in the flanks. An examination *per vaginam* reveals the fact that there is uterine haemorrhage, and bimanually the pouch of Douglas can be felt to be *uniformly* filled with blood or blood clot (haematocele).

Fig. 165.—Decidual uterine cast from a case of ectopic pregnancy. A window has been cut to show the smooth lining of the cavity. (*Natural size.*)

Some cases, however, are much less acute in their course: the bleeding is less rapid, and the blood may become encysted. In these circumstances the symptoms do not approach in severity those just described. The patient may soon be able to get about, and may not find it necessary to seek advice at all; and when she does so, it may only be because the 'mass' in the pelvis has suppurated.

In making a differential diagnosis in these cases conditions associated with haemorrhage, a 'lump' in the pouch of Douglas, and possibly with enlargement of the uterus, have to be taken into consideration. The only common diseases likely to give rise to error are ovarian tumours, especially cysts, and salpingitis with oöphoritis. The main points of differential importance are discussed under these diseases.

The histological evidence in regard to the diagnosis of ectopic pregnancy has already been alluded to.

In old standing cases with the formation of a lithopaedion diagnosis may be very difficult. Sometimes, however, the matter may be cleared up by the extrusion of foetal bones through a vesical, vaginal, abdominal or rectal fistula. In the last named, infection from the bowel may give rise to a pelvic abscess.

Many years ago, when ectopic pregnancy was looked upon as a very rare occurrence, collections of blood in the pelvis (haematocele) or in the tubes (haematosalpinx) were considered to be clinical entities. Now, however, it is known that a large proportion of these conditions is due to ectopic pregnancy. At the same time it must be borne in mind that ovarian apoplexy, and bleeding into the pouch of Douglas from fibromyomata or malignant growths and haemorrhage into the non-gravid tube are well known, and that cases have been described where a haematocele has followed the rupture of a Graafian follicle.

Treatment.—While this is essentially operative it varies in detail according to when it is carried out, and to the situation of the ectopic pregnancy.

When a diagnosis is made before rupture or abortion has occurred the pregnant tube should be removed at once.

If a patient be seen in a collapsed and almost pulseless condition from tubal rupture or abortion, with internal haemorrhage, the question naturally arises as to whether immediate operation should be performed, or whether the patient should be allowed to rally a little before anything is done. There is often considerable difficulty in coming to a decision. Some authorities advise delay, others counsel immediate operation. Whichever course is pursued cases will occasionally be lost, but on the whole immediate operation holds out the best prospect of ultimate recovery. One has always to bear in mind that if the patient die in an acute case she dies from haemorrhage, and that the proper surgical procedure is to get at and tie the bleeding point. On the other hand the bleeding is often temporarily arrested, and the patient rallies. An operation, however, can rarely be performed within an hour or so of the primary crisis, and in that time it is usually obvious whether the patient be rallying or not. If not, no time should be lost in opening the abdomen, and tying off and removing the affected tube (see p. 472). If the patient appear to be rallying the surgeon should not leave her, but allow her to recover as far as possible, and then operate—within a few hours of the onset of the symptoms. If a sudden change occur denoting further bleeding during this period of watching and waiting, immediate operation can be performed, for everything will be in readiness.

As soon as it is decided to operate—and this should be done on the spot, if possible, without removing the patient to a hospital or home—and the surgeon is ready to open the abdomen, an assistant should commence the intravenous infusion of normal saline solution when the patient has lost much blood (see p. 435). If this were to be done before the surgeon was ready to open the abdomen further haemorrhage might be caused before the bleeding point was secured. The operation is carried out rapidly and the abdomen quickly cleared of blood, which may be replaced by saline solution, and the patient returned to bed and treated forthwith for haemorrhage and shock (see pp. 425 and 426).

When the patient comes under observation at a later stage suppuration may have occurred in the sac, or the foetus may be in the process of extrusion; shrinkage, and the formation of a lithopaedion may be in progress; or a full-term child, alive or dead, with an extensive placental attachment, may demand interference. It is almost impossible here to discuss these conditions fully, especially as every case has to be judged on its merits. The most difficult to deal with surgically are those in which suppuration or extrusion is in progress, and where the placental attachment is large. One or two general principles may be mentioned. When extrusion is in progress it should

be allowed to proceed without interference if the condition of the patient be satisfactory; any remaining trouble can be dealt with subsequently. When there is suppuration in the sac it should be treated as an ordinary pelvic abscess, and emptied and drained through the posterior vaginal cul-de-sac, or possibly by an abdominal operation. In those cases in which the foetus has developed in the peritoneal cavity, and the placental attachments are extensive, it may be advisable to remove the foetus and allow the placenta to separate gradually, drainage being meanwhile employed; sometimes the placenta is retained and organized. When it is not attached to bowel, and the haemorrhage is controllable—directly, or indirectly by packing—the placenta should be removed at once.

In those cases in which pregnancy is not far advanced the products of conception can readily be removed from the adventitious sac with which they are surrounded. Subsequent drainage of the sac may or may not be necessary.

PREGNANCY IN A RUDIMENTARY HORN presents the same signs as a tubal pregnancy, both before and after rupture. The termination always occurs by rupture and never by abortion. The treatment is exactly the same as in the case of tubal pregnancy.

§ viii. UTERINE MOLES.

Two forms of 'mole' occur as the result of local pathological changes in connexion with the products of conception during early pregnancy.

BLOOD (CARNEOUS) MOLES form in the uterus as the result of subchorionic haemorrhages, similar to those occurring in tubal pregnancy; and the products of conception affected in this way may be retained many weeks in the interior of the uterus. Usually there is a history of bleeding from the uterus at the time the mole was formed. This may continue, or cease and recommence at a later date with the expulsion of the mole (fig. 166). If the mole be not expelled, and its presence be suspected, the cervix should be dilated and the uterus emptied. The etiology of this condition is still undecided.

The **symptoms** generally resemble those of incomplete abortion, which is the diagnosis usually made.

The **treatment** is, of course, the same in either case.

HYDATIDIFORM (VESICULAR) MOLE is of more importance from a gynaecological point of view than the blood mole, for the sequelae to

be mentioned directly are sometimes serious. Hydatidiform moles result from degeneration of the chorionic villi, and this usually commences

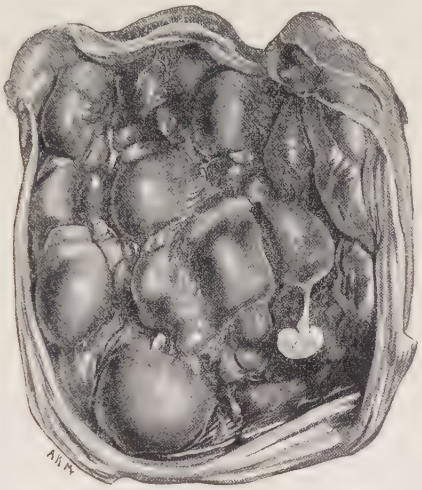

Fig. 166.—Carneous, or blood mole. The tiny foetus is seen still attached to one of the nodules formed by the subchorionic haemorrhage. At the edge of the mole, beyond the placental site, are the membranes which closed in the amniotic cavity. (*Natural size.*)

before the differentiation of the placenta. The mole may form a complete mass of grape-like vesicles with the ovum in the centre (fig. 167), or the degeneration may be limited in extent (fig. 168). Microscopically it is found that there is great proliferation of the syncytium and cells of Langhans' layer, with oedema and vacuolation of the connective tissue stroma of the villi (figs. 169 A and B). The causes of this 'degeneration' are unknown; they are supposed to be foetal in origin.

Tubal hydatidiform moles have occasionally been recorded.

The **symptoms** which enable one to make a diagnosis of intrauterine vesicular mole are disproportionate enlargement of the pregnant uterus (as a rule a uterus containing a vesicular mole of three months' duration reaches to the umbilicus); continuous or periodic haemorrhage, or a sanguineous watery discharge with, in some instances, the passage of some of the vesicles which have become detached; and lastly, the absence of the normal uterine souffle and foetal heart sounds. Unless vesicles be seen the diagnosis cannot be made with absolute certainty, although rapid and undue enlargement of the uterus with the other symptoms mentioned is very suggestive of a vesicular mole. On one occasion a diagnosis of hydatidiform mole was made in the case of a three months' pregnancy with concealed haemorrhage which caused

Fig 167.—Hydatidiform mole, with complete vesicular degeneration of the chorion. (*Reduced.*) (*E. Prowse.*)

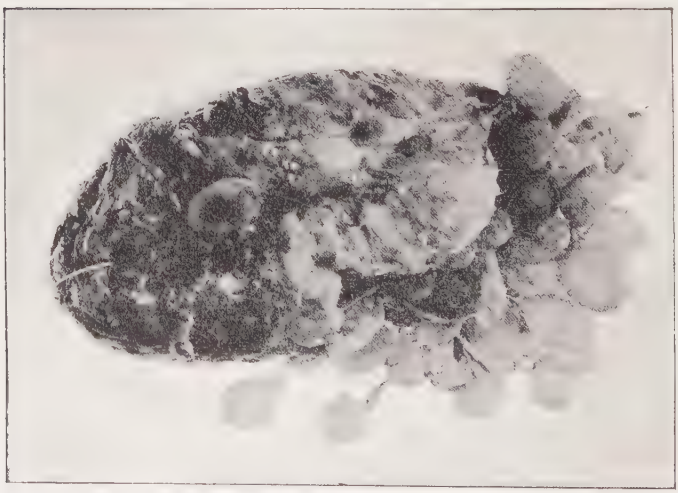

Fig. 168.—Hydatidiform mole, with incomplete or localized degeneration of the chorion. (*E. Prowse.*)

enlargement of the uterus above the umbilicus—an extremely rare state of affairs.

Treatment.—The uterus should be emptied as soon as the diagnosis is arrived at. If the mole be expelled from the uterus naturally it is

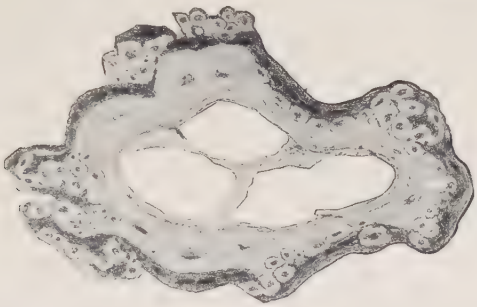

Fig. 169 A.—Histological appearance of villus of hydatid mole. The whole villus is somewhat collapsed with central softening. There is proliferation of both Langhans' layer and the syncytium. (*Winter & Ruge, 'Gynäkologische Diagnostik.'*)

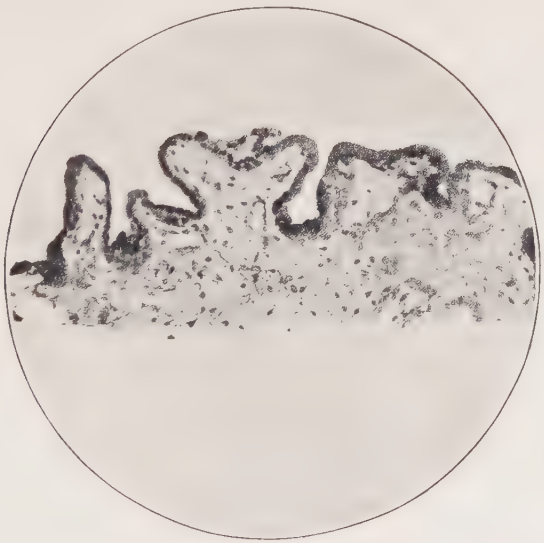

Fig. 169 B.—Section of wall of hydatidiform vesicle showing proliferation of the syncytium. (*Photomicrograph. E. Prowse.*)

always advisable to examine the interior of that organ, and by digital exploration make quite sure that no part of the mole has been left attached to the uterine walls.

The **sequelae** of hydatidiform mole are often serious. In the first place infection, both of the uterus and tubes, is liable to follow, so that the very greatest precautions must be taken in the management and treatment of these cases.

Subinvolution, which is also frequently seen, is due to two factors: firstly, the over distension of the uterine muscle from the rapid enlargement of the uterus, and secondly, the absence of metabolic processes, such as secretion of milk, which are normally associated with a high calcium content in the blood. Calcium lactate should therefore be given after evacuation of the uterus; should this not be sufficiently powerful in its effect infundibular extract or ergot must be administered.

But by far the most important of the after-results of hydatidiform moles is the development of the extremely malignant growth known as *chorionepithelioma* (deciduoma malignum or syncytioma); indeed, of all cases of this disease probably more than one half follow these moles, so that the practitioner should not lose sight of his patient, and any subsequent haemorrhages she may suffer from should be regarded with grave suspicion (see Chorionepithelioma, p. 378).

CHAPTER X.

INFECTIVE AND PARASITIC DISEASES OF THE GENITAL TRACT.

§ i. THE NORMAL CONDITIONS, AND THE MORBID PROCESSES THAT RESULT FROM INFECTION.

In considering the subject of infection, as in the case of any other question connected with pathological processes, it is necessary first of all to know the normal conditions that prevail.

The **vulva** is, of course, always covered with bacteria of many varieties, just as is any other exposed skin area.

The **vagina** in the virgin is normally sterile.

In a multipara with a relaxed or torn vaginal outlet the lower part of the canal may be covered on the surface with bacteria that have gained entrance from the vulva.

Döderlein has described an anaërobic bacillus which he calls the *vagina bacillus,* because he believes that it normally inhabits the vagina and gives rise to the production of lactic acid, which, he thinks, causes the acid reaction of the vaginal secretion. Other investigators have not confirmed these observations, and the probability is that the normal vagina is quite sterile.

Interesting experiments have been carried out by Menge who found that the bactericidal power of the normal vaginal secretion is very marked, and that pyogenic organisms introduced are rapidly killed.

The **uterus** is, like the vagina, normally sterile. During parturition and the puerperium the bactericidal action of the secretions, which are alkaline, disappears: so that any organisms introduced from the outside find a congenial soil in which to multiply.

The **Fallopian tubes** are also normally free from organisms.

While, therefore, the genital tract, except the vulval surface, is normally sterile, there are unfortunately many pathological conditions which are caused by the invasion of bacteria and parasitic organisms. Indeed, microorganisms give rise to a large proportion of the pathological lesions in the genital tract that the practitioner is called upon to treat. In addition, many other diseases and injuries are complicated by the presence of pyogenic organisms.

It is impossible to consider '*inflammatory processes*' apart from infections, for it must be understood that these are the result of defensive measures on the part of the host against the onslaught of bacteria. The results, however, of these protective measures will be fully described, each in the proper place, under the consideration of the organism responsible for them. When different organisms produce a similar result it will be unnecessary to consider the similar details more than once.

The following are the principal infective conditions which bacteria and parasites give rise to in the genital tract:—

Venereal diseases	*Gonorrhoea*	(Gonococcus)
	Syphilis	(Spirochaeta pallida)
	Soft sore	(Ducrey's bacillus)
Septic (pyogenic) infections		(Staphylococcus)
		(Streptococcus)
		(Bacillus coli communis)
		(Pneumococcus)
Tuberculosis		(Bacillus tuberculosus)
Gas-forming infection		(Bacillus aërogenes capsulatus)
Diphtheria		(Bacillus diphtheriae)
Tetanus		(Bacillus tetani)
Typhoid infection		(Bacillus typhosus)
Elephantiasis		(Filaria sanguinis hominis Bancroftii)
Actinomycosis		(Actinomyces)
Hydatid disease		(Echinococcus)

§ ii. GONORRHOEA.

The gonococcus produces inflammatory processes in the genital tract of woman more frequently than any other organism.

Before making a positive diagnosis of gonorrhoea, which is often impossible on the clinical evidence, it is necessary to isolate and recognize the organism. This may be done by either of the following methods:

1. A smear of the pus or discharge taken on a microscope slide is dried and stained with any ordinary aniline dye. If gonococci be present in large numbers they can be recognized readily with an oil-immersion lens by the characteristic arrangement, shape and distribution. They are completely decolourized by Gram's method.

Their characteristics are represented in figure 170, in which the organisms are seen to be crescentic or segmental in shape and to be arranged in pairs (diplococci), with the flat or concave surfaces opposed; sometimes two pairs are associated (tetrad). Further, it will be seen that for the most part the organisms are situated in the leucocytes which are present (intracellular). If the gonococci be few in number or be mixed with other cocci the recognition of them may be by no means easy.

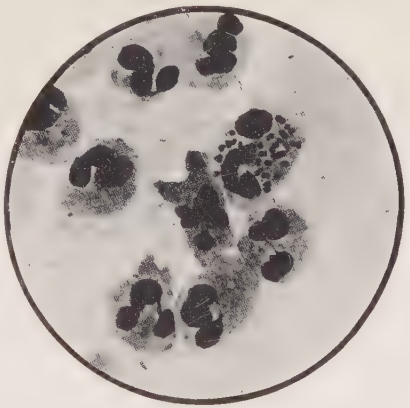

Fig. 170.—Gonococcus in the discharge from a case of vulvo-vaginitis in a child. In the field photographed a number of the organisms are seen in the cytoplasm of a leucocyte (intracellular distribution). × 900. (*Photomicrograph.*)

In pus—such as that obtained from a pyosalpinx (*vide infra*)—which has originated as the result of inflammatory processes associated with gonococcal infection of the Fallopian tubes, it is usually impossible to find the organisms, for they have disappeared, leaving the pus sterile.

2. Cultures can be made—only in very favourable circumstances—on Wertheim's medium (one part human blood serum; two parts agar). It is most difficult to obtain cultures of this organism; and even if it be grown, frequent subcultures are necessary if the organism is to be preserved.

Pure cultures can sometimes be obtained from a very recent tubal infection. As a rule in infections of the lower part of the genital tract the gonococci are mixed with other organisms.

Etiology and frequency of occurrence.—The lesions found are the result of direct infection with the gonococcus. This may be brought about in several ways. The vulvo-vaginitis of children is sometimes produced by infection from the mother during washing or nursing. Again the careless examination of adult patients in an out-patient room may lead to infection from one to another. In

order to avoid this freshly sterilized implements and gloves must be used for each case.

The commonest way, however, by which the disease is spread is by impure sexual intercourse. Very many prostitutes have the disease in an active or latent form, and they may pass it on to all with whom they have connexion.

Young married women are frequently infected by their husbands, although the latter may believe themselves to be cured at the time of marriage. It has been estimated that about half the married women in every large town are infected in this way. This estimate is probably too high; at the same time there is no doubt that a large proportion of all cases of sterility is due to gonococcal infection of the female genital tract. It is important to remember that it is not necessary for the husband to have the disease in an active form to render infection of his wife likely. He may be quite cured symptomatically, yet be capable of infecting his wife. One or more attacks of the disease do not produce immunity.

Course of the disease.—The gonococcus produces definite lesions in all parts of the genital tract, and even remote results in various parts of the body. It will be best in considering infections of the genital tract to trace the effects produced on the various parts from below upwards.

INFECTION OF THE VULVA.—The external vulva may harbour the gonococcus for a long time without any definite lesions being produced. In the mild cases there is merely a little reddening of the labia minora, the urethra and neighbouring parts, with possibly some muco-purulent discharge. In severe cases there is definite acute **vulvitis**, in which condition the external genitals become swollen, oedematous and painful; and on separating the labia majora the parts are seen to be much congested, and there is a profuse purulent discharge. In dirty women crusts form, and underneath these small patches of superficial ulceration may be found—cracks and fissures also are not unusual. The discharge may give rise to eczematous skin lesions on the thighs and groins. Gonorrhoeal warts or mucous papules may also be seen. The inguinal glands are usually enlarged and may suppurate.

When the acute stages have passed off an examination of the parts will show that the orifices of the ducts of Bartholin's glands and the mouths of the numerous follicles of the parts within the labia minora are bright red and stand out against the paler coloured background. These lesions are due to the fact that the organisms are still present within the ducts. Beads of pus can usually be expressed from the ducts of the glands of Bartholin, and the urethral glands.

Urethritis is generally associated with gonorrhoeal vulvitis and this may be followed by *cystitis*, and even by *pyelitis* if the organisms spread up the ureters to the kidneys.

Urethritis is marked by 'scalding in the passage' during micturition, and cystitis by the constant desire to empty the bladder.

In cystitis, due to gonorrhoea, the urine is acid. Infection of the urethral glands invariably occurs and is an important diagnostic sign. Urethritis and the other lesions of the urinary tract are by no means so severe in women as in men.

Infection of Bartholin's glands.—This is of quite common occurrence in gonorrhoeal infection, and may occur early or late in the disease. The organisms spread down the duct giving rise to a catarrhal condition which blocks the passage and causes the secretion from the gland to accumulate behind the obstruction. Eventually suppuration may occur. It has already been mentioned that infection of these glands is indicated by the 'macula,' or zone of congestion, seen at the orifice of the duct.

Usually the infection is bilateral, but not always so. When suppuration occurs a large and very tender 'lump' can be felt between the finger placed inside the vaginal orifice and the thumb on the outside. This condition causes great pain on walking. The abscess must be opened by an incision on the inner surface of the labium majus, and drainage employed for a few days.

Figure 171 is a photomicrograph of a section through the wall of an abscess in a gland of Bartholin.

INFECTION OF THE VAGINA.—This does not usually occur except in quite young children (vulvo-vaginitis). The thick layer of epithelium, comparative absence of glands and the normal bactericidal action are probably the reasons why infection of the adult vagina so rarely occurs. The organism may, of course, be found in the vaginal discharge, but probably in these cases it is harboured by the cervix and is only present incidentally, and not pathologically in the vagina.

Acute vulvo-vaginitis in children—whether gonorrhoeal or otherwise—may be followed by atresia of the vaginal orifice.

INFECTION OF THE UTERUS.—There is no doubt that gonorrhoea may be an ascending disease, and that the infection starting on the vulva may gradually ascend along the mucous surfaces until at last it reaches the peritoneum. At the same time, often—probably most often—the cervix uteri is the part first and directly infected. This results from

coitus. From the cervix the infection may spread up to the body of the uterus and on through the tubes to the peritoneum, unless it be cured early.

When the **cervix** is infected, there is, in the acute stages, a plentiful, purulent secretion which fills the upper part of the vagina.

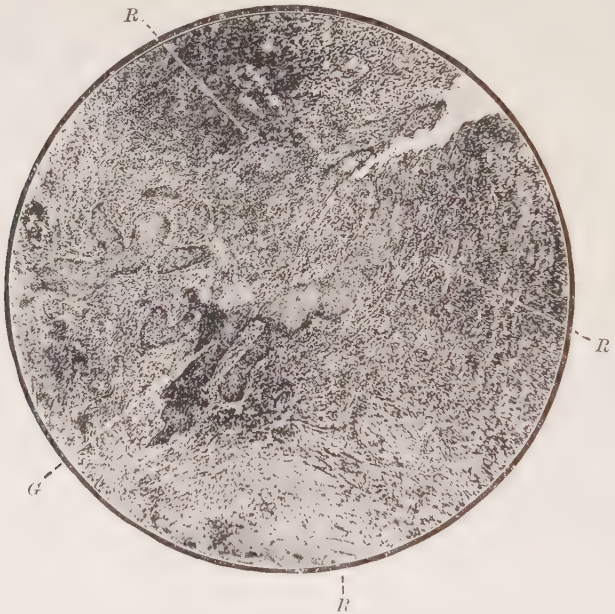

Fig. 171.—Acute inflammation of Bartholin's gland. × 100.
(*Photomicrograph.*)

R. Round cell infiltration. *G.* Gland acini undergoing destruction.

The cervix is swollen and tender to the touch, and on inspection the external os is seen to be surrounded by a zone of congestion. In multiparae the mucous membrane, when in a state of acute inflammation, may be pouting and extruded (fig. 172). Later in the disease chronic cervicitis, with cystic cervical glands (ovula Nabothii) (fig. 173) may be the only signs of a previous attack of gonorrhoea.

When the disease spreads to the **body of the uterus**, the endometrium becomes swollen and congested in the acute stage—gonorrhoeal endometritis results. In the large majority of cases gonorrhoeal infection of the uterus is limited to the endometrium, and it is unusual to see infection of the walls of the uterus except after pregnancy. If a woman be infected during the puerperium the results are disastrous; for the soft involuting uterus makes an excellent nidus for the organism, so that the walls are infected and salpingitis also invariably follows. In these circumstances the uterus becomes enlarged and extremely

cocci. From the cervix the infection may spread up to the body of the uterus and on through the tubes to the peritoneum, unless it be cured early.

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(*Photomicrograph.*)

A. Round cell infiltration. G. Gland acini undergoing destruction.

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PLATE II.

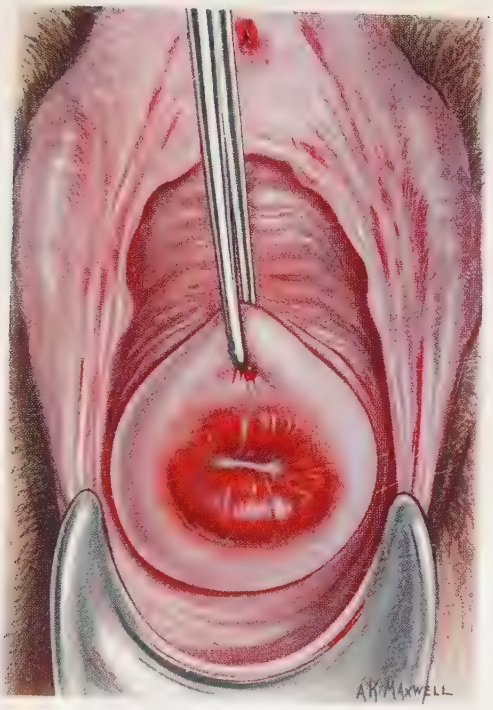


Fig. 172. Acute gonorrhoeal cervicitis with extrusion of the cervical mucosa.

[*To face p. 246.*

PLATE III.

Fig. 173. Chronic cervicitis. Note the bulky cervix with cystic degeneration (*Ovula Nabothi*). In the upper part of the picture a caruncle is seen hanging from the orifice of the urethra.

[*To face p. 247.*

tender (acute metritis). The patient complains of a heavy, aching pain in the lower abdomen, which is much aggravated on movement or coitus.

It is, however, with the chronic stage, or with the ultimate results, of gonorrhoeal infection upon the uterus, that the practitioner is most frequently concerned. As already mentioned, cervicitis and endocervicitis, with a bulky, bluish cervix in which numerous glandular cysts are imbedded (fig. 173) is the ultimate result upon the cervix in many cases. In others hardly any changes are to be noted, except that there is a profuse leucorrhoeal discharge. In chronic gonorrhoeal infection of the body of the uterus the endometrium is found to be in a condition of chronic interstitial endometritis, in which the stroma is dense and the glands few, far between and distorted (fig. 174); the muscular walls of the organ, when infected in the puerperium, become bulky and hard (chronic 'fibrotic' metritis). There may be considerable leucorrhoeal discharge, and menstruation is profuse and painful.

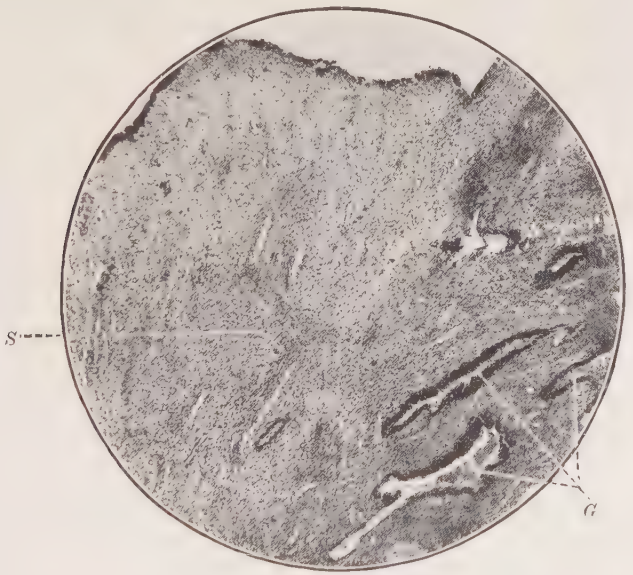


Fig. 174.—Chronic endometritis, showing very dense stroma with fibrosis (*S*) and irregular and dilated glands (*G*). ×75. (*Photomicrograph.*)

INFECTION OF THE FALLOPIAN TUBES, OVARIES AND PERITONEUM.—These structures from their close anatomical relationships and connexions cannot be considered separately.

Acute salpingitis.—Gonorrhoeal infection may remain for a long time in the uterus without spreading to the tubes. Once this occurs there are usually very definite indications of **pelvic peritonitis**, for the

infection rapidly spreads to the pelvic peritoneum through the abdominal ostium and eventually through the walls of the tube. All the early symptoms are, in fact, due to peritonitis, which gives rise to the sudden onset of acute abdominal pain with elevation of temperature and increase in the pulse rate. Sometimes there is fixation of the lower part of the abdominal wall, with well marked rigidity. There may be frequent micturition and obstinate constipation. After some days, or perhaps as long as a fortnight, the acute symptoms may disappear and nothing remain to remind the patient of what has happened; indeed entire recovery may follow. Far more often, however, the attack is merely the forerunner of many others.

In an ordinary acute case, before much destruction of tissue has occurred, the tube is seen to be acutely inflamed and enlarged. The fimbriae are swollen and turgid.

A section of the tube in this condition, when examined microscopically, shows congestion of the blood vessels and swollen *plicae* (fig. 175), with round cell infiltration of the stroma.

Fig. 175.—Acute salpingitis. Low power view of section showing the swollen *plicae* of the mucous membrane with desquamation of the surface epithelium (*D*) and a tendency of the adjacent folds to adhere together (*A*). In various parts of the muscular wall of the tube there are patches of round cell infiltration (*R*). ×15. (*Photomicrograph.*)

As just stated, entire recovery sometimes takes place, and all the symptoms subside. On the other hand, after one or two acute attacks symptoms which are the result of the pelvic lesions become

continuous and the disease assumes a chronic form, subject to periodic acute exacerbations.

The ovary is generally found to be oedematous and much enlarged, but actual infection of the stroma—oöphoritis—is usually a later process.

Chronic salpingitis.—It must, as already indicated, be understood that chronic salpingitis necessarily includes pelvic peritonitis and chronic oöphoritis.

When the disease pursues a chronic course subsequent to an acute attack, which does not entirely recover, there is a gradually increasing infiltration of the tubes, and the disease, which in gonococcal infection is confined for a long time to the mucous membrane, eventually spreads through the walls to the peritoneum, and adhesions form. The abdominal ostium becomes sealed by a somewhat complicated process, whereby the serous coat overlaps the fimbriae and becomes adherent at the orifice to the opposing surface, or is assisted in the closure by external (pelvic) inflammation and adhesions. In this way the round closed end of the tube is lined with a continuous mucous coat (fig. 176), just as is the

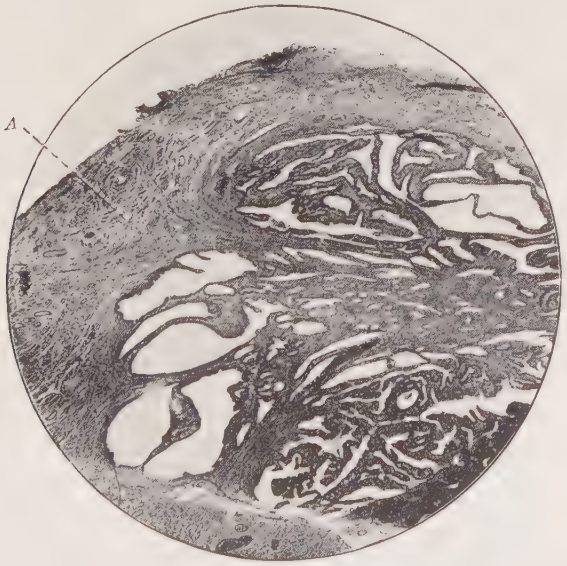


Fig. 176.—Closure of the abdominal ostium of the Fallopian tube subsequent to salpingitis. The section is cut parallel with the lumen of the tube. *A*. marks the point at which the actual closure occurred. To the right the *plicae* represent the mucous membrane of the enclosed fimbriae. ×20. (*Photomicrograph*).

ordinary side wall of the tube. The uterine ends of the tubes are closed by the much congested mucous membrane, and total obliteration

of the lumen may sometimes follow. If the infection be mild and effectually resisted in the early stages, after both ends of the tube have been sealed it may become contorted and distended with a clear secretion, the *plicae* becoming thinned and flattened, and the walls of the tube stretched. In this way a **hydrosalpinx** is formed (fig. 177). The

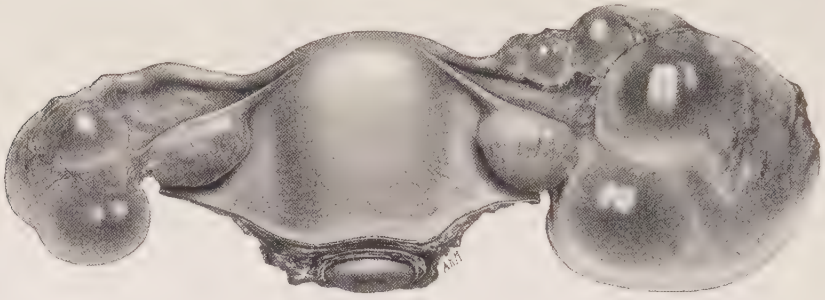


Fig. 177.—Double hydrosalpinx.

microscopical appearances of the tube wall and mucous lining in these circumstances are well seen in figure 178. In some cases a tubo-ovarian cyst may be produced (see p. 293).

The more usual course, however, is for pus to accumulate in the

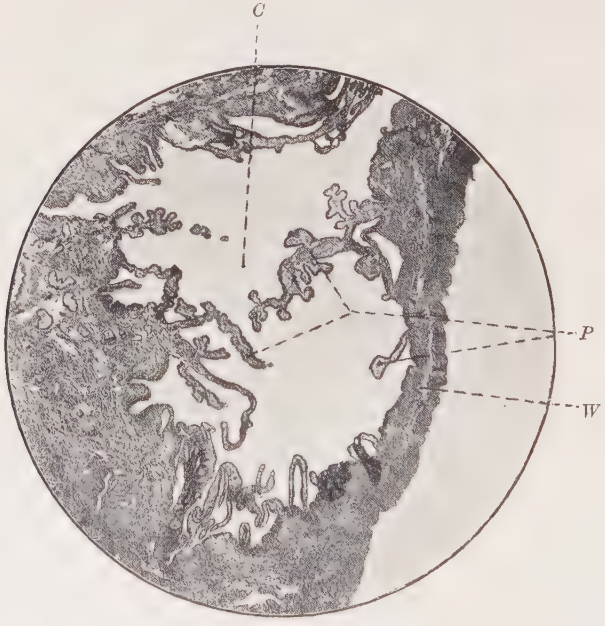


Fig. 178.—Section of hydrosalpinx. The dilated cavity of the tube (*C*) with stretched tube wall (*W*) is lined by flattened and thinned out folds of mucous membrane (*P*). ×15. (*Photomicrograph.*)

occluded tubes and **pyosalpinges** to result—gonorrhoeal salpingitis being almost invariably bilateral. An abscess in the ovary may also be found (fig. 179); this may communicate with the interior of the pyosalpinx (tubo-ovarian abscess).

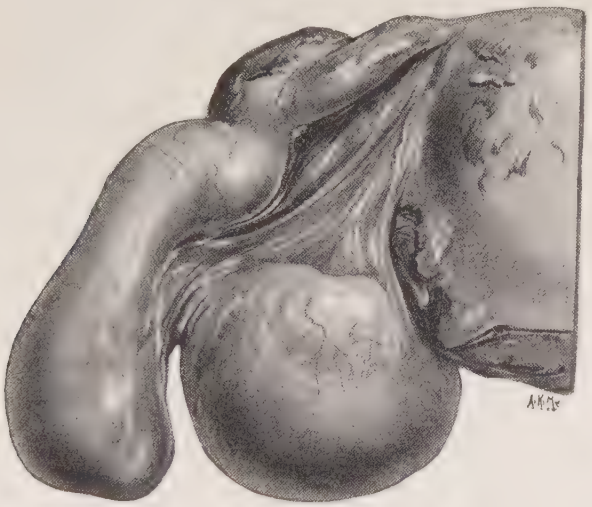


Fig. 179.—Pyosalpinx with abscess in the ovary.
Only one half of the specimen is shown. It will be noticed that the uterus was removed by supravaginal hysterectomy.

When these suppurative conditions exist the tubes and ovaries are bound down by dense peritoneal adhesions. Sometimes, when the disease is virulent or a mixed infection is present, extratubal suppuration occurs, and in such circumstances large abscesses may be met with in the pelvis. In some few cases the peritonitis is not limited to the pelvis and general infection of the peritoneum may be found; this is usually the result of the rupture of a pelvic abscess.

Microscopically we can recognize several stages in the processes which eventuate in a pyosalpinx. First, as already seen, there is vascular engorgement, and the folds of the mucous membrane are swollen and infiltrated with round cells which extend to the walls of the tube —acute salpingitis (fig. 175). Next we notice that the epithelium covering the *plicae* is shed (fig. 180), and the exposed surfaces of adjacent folds have become adherent. Finally the interior of the tube is lined with granulation tissue (fig. 181), which secretes the purulent contents of the tube.

If the infective process extend to the ovary, as is frequently the case, an **acute oöphoritis** is produced. This is evident in a microscopical section by the round cell infiltration of the ovarian stroma

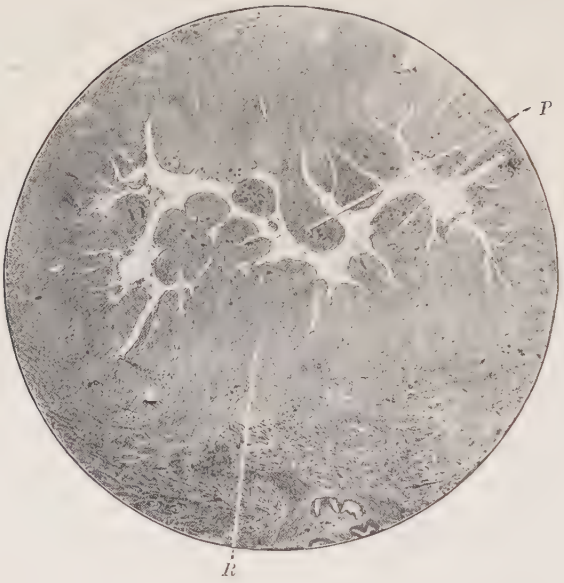


Fig. 180.—Acute salpingitis. Early stage of pyosalpinx. The section shows great swelling of the individual *plicae* (*P*), which are bare of epithelium, and have in many places become fused together. The mucous membrane and tube wall are densely packed with leucocytes (*R*). ×15. (*Photomicrograph.*)

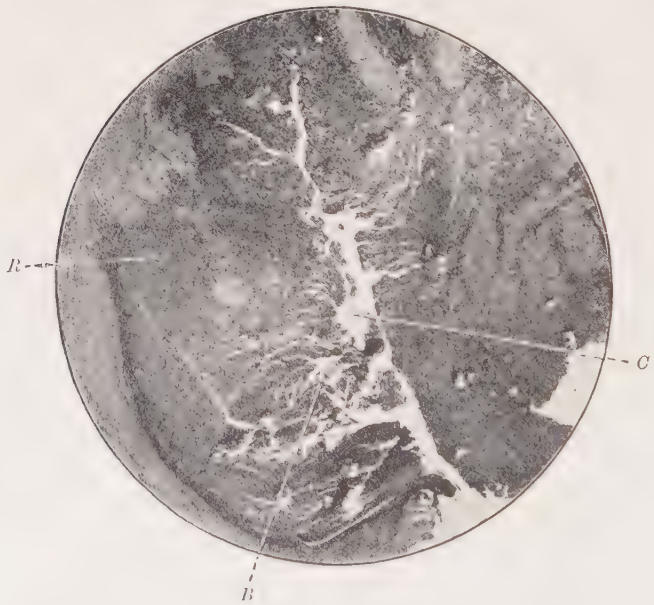


Fig. 181.—Acute salpingitis. Late stage of pyosalpinx. The cavity of the tube (*C*) is almost obliterated (when not distended with pus) and the mucous lining is converted into breaking down granulation tissue (*B*), the whole tube being densely infiltrated with round cells (*R*). ×15. (*Photomicrograph.*)

(fig. 182). An ovarian abscess may form subsequently, as already mentioned, or the condition may clear up completely. Sometimes, however, a condition of **chronic oöphoritis** follows, in which the tunica

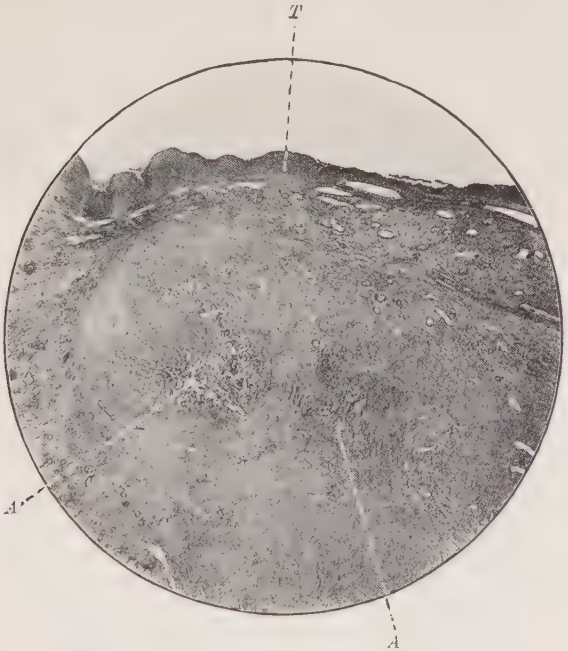


Fig. 182.—Acute oöphoritis. Parts of the ovary are invaded by microorganisms, and this has resulted in round cell infiltration. At *A* there is commencing abscess formation. The tunica albuginea (*T*) covering the ovary is much thickened. ×15. (*Photomicrograph.*)

albuginea and the ovarian stroma are converted into fibrous tissue, or even become hyaline from the interference with the blood supply (fig. 183). There is in these circumstances a tendency to the formation of follicular cysts.

It may be mentioned here that oöphoritis unassociated with infective processes in the pelvis is extremely rare, if we exclude the metastatic infection that sometimes occurs with mumps; so that the loose way in which obscure pains in the lower abdomen are ascribed to 'ovaritis' should not be encouraged.

Symptoms and **physical signs.**—While these pathological changes have been taking place a very definite train of symptoms has been troubling the patient. Apart from the periodic exacerbations of pain and acute peritonitic symptoms, there is a continual aching and bearing down pain in the pelvis; menstruation is profuse and painful, and there is usually intense dyspareunia. The patient is disinclined to walk; she becomes ill and 'neurotic,' and she loses weight. The

temperature is usually normal, but when pus is present and the organisms are still active it may be hectic in character, and there may even be rigors marking the change from the subacute condition to the acute exacerbation.

On bimanual examination (abdomino-vaginal and abdomino-rectal) the uterus is found to be fixed posteriorly by adhesions; and extending across the pouch of Douglas large, tender masses can be felt bound down to the back of the broad ligaments and uterus. Sometimes the enlarged tubes do not fall down but become fixed near the

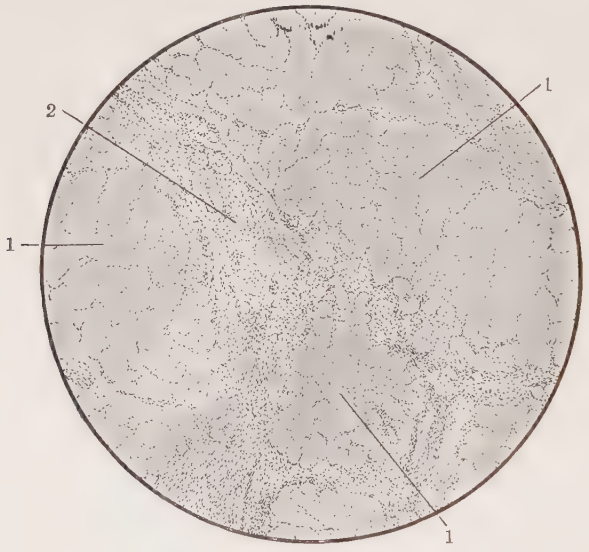


Fig. 183.—Chronic interstitial oöphoritis. × about 15. (*From Orthmann's 'Gynaecological Pathology.'*)

1. Corpora albicantia. 2. Interstitial connective tissue which is becoming fibrous.

brim of the pelvis on either side, or in front of a retroverted uterus; this, however, is rare.

These signs and symptoms allow a diagnosis of salpingitis with probable pus formation to be made with comparative certainty.

Great care should be taken when examining these cases, for rough handling may cause an acute exacerbation.

Remote complications of gonorrhoea are gonorrhoeal 'rheumatism,' gonorrhoeal arthritis and endocarditis. As these complications fall into the hands of the general physician and surgeon for treatment, they need not be further discussed here.

Treatment.—*Prophylaxis* is, of course, the ideal to be aimed at; but until medical men engage more freely in municipal and parliamentary

life we cannot hope for the legislation which is necessary to stamp out venereal diseases. To the medical man who understands and appreciates the ravages wrought, and the misery entailed by gonorrhoea and syphilis, it seems incredible that intelligent men can foregather and legislate concerning infective and contagious diseases and do no more than fly the kite of lofty morals over the venereal infections that undermine the physique and happiness of a large proportion of the race. To the surgeon falls only the lot of offering advice which may or may not be accepted.

The man with gonorrhoea may be advised that he ought not to marry until he is *bacteriologically cured*; but nothing can be done to stamp out the disease at its source—prostitution—until gonorrhoea is notifiable, and until prostitution is regulated and controlled.

Unfortunately, then, we are only concerned in the treatment of the disease as it presents itself to us. It is comparatively uncommon to see acute forms of gonorrhoea in the female; when we do so, it is generally either in those who have been recently pregnant and in whom the disease has rapidly ascended, or in children with vulvo-vaginitis.

Treatment of acute cases.—This must be active. In children with vulvo-vaginitis the parts affected should be swabbed several times daily with an antiseptic solution—the preparations of silver, such as argyrol (20 per cent.), and protargol (10 per cent.) are the best—and the vagina douched with a weak solution of sodium permanganate or a solution (0·5 per cent.) of argyrol. After using the antiseptic lotion and douche the following dusting powder should be used as soon as the parts are dry:

℞ Calomel, - - - ℥ ss
Bismuthi Carb., - - ℥ ss
Boracis, - - - ℥ iij
Amylum - - - ad ℥ j
M. ft. pulv.

It need hardly be pointed out that the powder must not be dusted on with the same powder-puff each time. A fresh piece of cotton wool should be used for each application.

In addition, after each washing of the vulva, the following pessary should be placed in the vagina.

℞ Iodoformi, - - - gr. iij
Ol. Eucalypti, - - m. iij
Bismuthi Carb., - - gr. iij
Ol. Theobromae, - ad gr. xv
M. ft. pessus.

In adults the same treatment of the vulva and vagina may be employed; but more active local treatment is advisable if the uterus be

involved. It has already been mentioned that the vagina of adults is but rarely infected by the gonococcus, consequently simple douching will wash out any organisms there may be in it.

In regard to the uterus it is best to dilate the cervix in order to have free access to all parts of the uterine cavity, which should be carefully swabbed out with pure carbolic acid applied by means of wool wrapped round Playfair's intrauterine probe (fig. 184). Care must be taken to protect all the neighbouring parts. After the carbolic

Fig. 184.—Playfair's probe.

acid has been freely applied to the interior of the uterus and several minutes allowed to elapse in order that the accessible organisms may be killed, the uterus is swabbed out with alcohol, which neutralizes the caustic effect of the carbolic acid. Consequently, if the vulva or vagina be accidentally touched with the carbolic acid, alcohol should be applied to the part. Some prefer to apply the tincture of iodine to the interior of the uterus, and certainly it is very powerfully germicidal in its action. Strong solutions of argyrol and protargol may also be used.

The only disadvantage of antiseptics is that they destroy the natural processes of resistance at work locally, so that it is advisable to be satisfied with one intrauterine application in the hope that most of the organisms have been killed and that the natural processes will account for the rest. Subsequently argyrol douches (1 per cent.) should be employed together with pessaries a little larger than those used for children. These are inserted after each douche.

Apart from energetic local treatment some general measures are also advisable.

The patient should be kept completely at rest in bed. This is a most important factor in the successful treatment of acute cases. The diet must be light and nutritious and all alcohol or other stimulants, such as tea and coffee, prohibited. Saline aperients should be given on alternate days. Internal medication, by means of cubebs, copaiba or sandal wool oil, is advocated by some authorities, but it is doubtful if such drugs have much good effect in the female.

Hygienic surroundings are most essential, and if the patient can afford it she should be sent to a bracing seaside locality under the care of a competent nurse; there to rest and indulge in mild Swedish exercises until the disease is well under control.

Owing to the serious results that may follow gonorrhoea too great trouble cannot be taken in its cure if the disease be detected early.

Treatment of chronic cases.—Unfortunately the majority of cases

do not present themselves for treatment until the complications which occur in the later stages have given rise to some disability which calls the patient's attention to her condition.

The complications in these circumstances may be discussed in connexion with the vulva, the uterus or the appendages.

Infection of Bartholin's glands has already been dealt with.

Gonorrhoeal warts may be treated with X-rays or scraped with a sharp spoon.

The uterus may be affected only as far as the cervix; or the disease may extend to the body. In regard to the cervix, if there be extensive chronic cervicitis the cervix should be amputated (see p. 497). If the infection be slight curetting, and the application of argyrol (20 per cent.) to the cervical canal three times a week, with daily antiseptic douches, may be all that is necessary. If the body of the uterus itself be affected the cervix should be dilated, and the cavity curetted and afterwards swabbed with argyrol (20 per cent.) or iodine (10 per cent.).

It must, however, be clearly understood that old-standing chronic infection of the uterus and cervix is by no means easy to cure by local treatment short of radical measures; so that in chronic ('fibrotic') metritis, attended by profuse haemorrhages, hysterectomy is sometimes indicated. Chronic salpingitis may be treated in the milder cases by expectant methods such as hot antiseptic douches, tampons of glycerine and ichthyol, and any of the other methods advised to bring about resolution in inflamed tissues.

Undoubtedly many cases of gonorrhoeal salpingitis get well; that is to say, they are not only symptomatically but functionally cured, so that the patient may be fertile and bear children. For this reason no case should be operated upon until it is quite clear that recovery is impossible. Operation—which usually consists of removal of the tubes (salpingectomy)—is, however, demanded in the following circumstances:

1. When there is pus formation in the tubes.
2. When there are extensive adhesions, binding the uterus and appendages together in Douglas' pouch, and giving rise to severe pain, menorrhagia, or other troublesome symptoms which produce a condition of chronic invalidism.

In some few cases that require operation, but in which the infection is mild and there is no pus formation, the uterine end of the tube may be saved, and an artificial ostium formed.

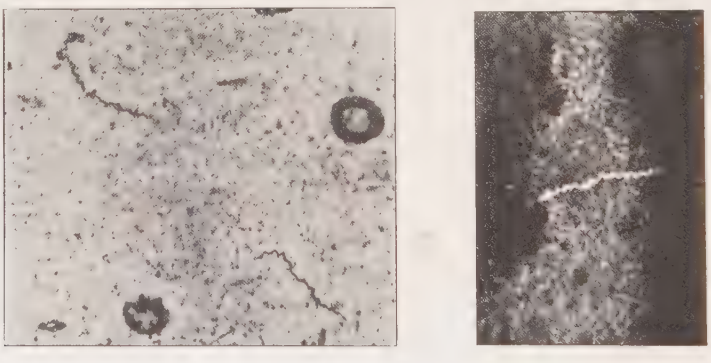
When the patient is under forty an ovary and the uterus should be left, if at all possible. The total ablation of the genital organs recommended by some is not only unwarrantable but occasionally detrimental to the future health of the patient.

In very severe cases of pyosalpinx with, perhaps, peritoneal abscesses, in which the infection is mixed, it is sometimes wise to drain all the accessible pus sacs through the posterior vaginal cul-de-sac (see p. 509) before proceeding to remove diseased structures by the abdominal route (see p. 472). In this way extension of the infection may be avoided. Bacteriological research has shown, however, that in a very short time the pus in a pelvic abscess, due to gonococci, becomes sterile; so that the abdominal operation may be conducted with safety, and completed without drainage in the majority of cases.

§ iii. SYPHILIS.

The spirochaeta pallida has now been accepted as the organism responsible for the common venereal disease known as syphilis.

This organism with the Giemsa stain is coloured a pale red tint, and is seen to be of a corkscrew shape (fig. 185 A). Recently Burri showed that if the smear containing the organisms be stained with Indian ink the spirochaete remains unstained and stands out clearly against the darkly stained background (fig. 185 B). The spirals in the spirochaeta pallida are much closer than those seen in the spirochaeta



A B

Fig. 185.

A.—Spirochaeta pallida from a primary chancre. The 'smear' has been stained by Giemsa's method. In the illustration two organisms, like closely curled threads, can be seen. The large dark structures are red blood corpuscles. ×900. (*Photomicrograph.*)

B.—Spirochaeta pallida from a primary chancre, showing up unstained in a 'smear' coloured with Indian ink. ×900. (*Photomicrograph.*)

refringens, with which the former organism is frequently confused. With Löffler's stain the flagella, which render the spirochaete motile, may be demonstrated—one at each pole. It has been found in the

Fig. 186. Large [illegible] end of the ring) labium matus, with [illegible] a juxtaposed sore of the [illegible] photograph. Shiloh, S. C. [illegible] (Army Medical Museum Publications.)

(See page 258)

In very severe cases of pyosalpinx with, perhaps, peritoneal abscesses, in which the infection is mixed, it is sometimes wise to drain all the accessible pus sacs through the posterior vaginal cul-de-sac (see p. 509) before proceeding to remove diseased structures by the abdominal route (see p. 422). In this way extension of the infection may be avoided. Recent bacterial research has shown, however, that in a very short time the pus in a pelvic abscess, due to gonococci, becomes sterile: so that the abdominal operation may be conducted with safety, and completed without drainage in the majority of cases.

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A. Spirochaeta pallida from a primary chancre. The 'smear' has been stained by Giemsa's method. In the illustration two organisms, with closely curled threads, can be seen. The large dark structures are red blood corpuscles. (×900. *Photomicrograph.*)

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PLATE IV.

Fig. 186. Large flat primary sore on the posterior end of the right labium majus, with indurated oedema of the whole labium. There is a juxtaposed sore of the left labium majus. *(From a direct colour photograph. Shillitoe: System of Syphilis, Oxford Medical Publications.)*

[*To face p. 258.*

PLATE V.

Fig. 187. Syphilitic condylomata. There is oedema of both labia majora. (*From a direct colour photograph. Shilliloe: System of Syphilis, Oxford Medical Publications.*)

[*To face p. 259.*

merely of an **erosion**; or there may [illegible] a **papule** or a [illegible] **Hunterian chancre** ('hard sore').

[illegible] nothing specific or distinctive about the erosion; but the [illegible] usually seen to be round or oval-shaped with hard, clean-cut edges and a varnished surface. The papule is an indurated elevation, often of dark colour; while the Hunterian chancre presents the classical features—a raised indurated surface with hard infiltrated ('split-pea' or 'parchment') base.

The following are the sites on which primary lesions of the genitalia are found in their order of frequency of occurrence: labia majora, labia minora, fourchette, cervix uteri, meatus urinarius and region of the vestibule, and lastly—extremely rarely—on the vaginal walls.

When the *primary infection is on the vulva* there may be multiple lesions—probably arising from [illegible] inoculation. As a rule there is marked oedema of the labia in the early stages, but both may be in the same condition (fig. 186). The glands in the inguinal region are very often enlarged and [illegible]. In the case of a *primary chancre on the cervix uteri*, if it be [illegible] there is only one [illegible] a waxy-grey convex papule; later this becomes [illegible] and eroded on the surface, and bleeds easily. Chancres of the [illegible] which are by no means common—are always [illegible] and [illegible] the pelvic glands which become secondarily infected. [illegible] must be differentiated from carcinoma (*see* p. [illegible]).

Secondary lesions. [illegible] are the most common secondary manifestations.

Condylomata.—These are present [illegible] the moist region of the vulva. Sometimes the whole of the vulva and anal region are covered with them (fig. 187).

Macular roseolar rash.—This rash, which produces a mottling of the skin, comes out in crops on various parts of the body, and takes a week to reach the maximum. The [illegible] back, chest and neck are the parts most commonly affected.

Sore throat.—This may be [illegible] in character or excessively [illegible]

Fig. 187.—Syphilitic condylomata. There is œdema of both labia [illegible] From a direct colour photograph. *Shillitoe's System of Syphilis*, Wright & Medical Publications.

To face p. 259

primary chancre and associated lymphatic enlargements, in the papular and macular rashes, in condylomata, and in all the other secondary lesions. It has also been found in the tissues in congenital syphilis.

Syphilis is a very widespread disease, which may be recognized by its *primary*, *secondary*, or *tertiary* manifestations.

Primary lesions.—These may be genital or extragenital. Here, we are only concerned with the genital lesions. The primary lesion may be so slight as to escape recognition by the patient; indeed, in some cases it is doubtful if it could be detected on careful medical examination.

The primary 'sore' may consist merely of an **erosion**; or there may be a **small ulcer**, a **papule** or a true **Hunterian chancre** ('hard sore').

There is nothing specially distinctive about the erosion; but the ulcer is usually seen to be funnel-shaped with hard, clean-cut edges and a varnished surface; the papule is an unbroken elevation, often of a dark colour; while the Hunterian chancre presents the classical features—a raised, flattened surface with hard, indurated ('split-pea' or 'parchment') base.

The following are the sites on which primary lesions of the genitalia are found in their order of frequency of occurrence: labia majora, labia minora, fourchette, cervix uteri, clitoris and region of the vestibule, and lastly—extremely rarely—on the vaginal walls.

When the *primary infection is on the vulva* there may be multiple lesions—probably arising from juxtaposition. As a rule there is marked oedema of the labium chiefly affected, but both may be in the same condition (fig. 186). The glands in the inguinal region are very often enlarged and 'shotty.' In the case of a *primary chancre on the cervix uteri*, if it be detected very early one sees a waxy-grey convex papule; later this becomes purple in colour and eroded on the surface, and bleeds easily. Chancres on the cervix—which are by no means common—are always single; and it is the pelvic glands which become secondarily infected. Chancre of the cervix must be differentiated from carcinoma (see p. 366).

Secondary lesions.—In women the following are the most common secondary manifestations.

Condylomata.—These are papules modified by the moist region of the vulva. Sometimes the whole of the vulva and anal region are covered with them (fig. 187).

Macular (roseolar) rash.—This rash, which produces a mottling of the skin, comes out in crops on various parts of the body, and takes a week to reach the maximum. The abdomen, thighs, back, chest and neck are the parts most frequently affected.

Sore throat.—This may be mild in character or excessively foul

and sloughing. The characteristic snail-track markings can usually be seen.

Loss of hair is of common occurrence.

Universal glandular enlargement may occur but is somewhat rare.

Tertiary manifestations.—These come within the range of gynaecology only in regard to gummata and other local lesions of the genital tract. The general lesions found elsewhere in the body belong to the province of general medicine.

Gummata are very rarely found in any part of the genital system; when they do occur they form, of course, localized granulomata.

Esthiomène.—This condition is now generally considered to be a late syphilitic lesion, although it has been stated by many authorities to be tuberculous. There is great hypertrophy of the vulva with extensive ulceration. The ulcerated areas, which usually start in the region of the posterior commissure, are surrounded by hard, raised margins. Hitherto excision has been practised in these cases; but it is advisable to try first the effects of mercury and the iodides. It is quite possible that both tuberculous and syphilitic lesions have in different cases produced similar clinical pictures. An attempt therefore should always be made by a competent pathologist to isolate the organism responsible for the particular lesion.

Fig. 188.—False elephantiasis of the vulva. (*From Roberts' 'Gynaecological Pathology.'*)

False elephantiasis.—This condition also is generally supposed to be syphilitic in origin, chiefly because a syphilitic history is often to be obtained. In any case it is quite a different disease from true elephantiasis (see p. 281); although in false elephantiasis a blockage in the lymphatics also occurs, producing a similar result on a small scale (fig. 188) to that seen in true elephantiasis.

Syphilis and pregnancy.—When a pregnant woman herself contracts syphilis the local manifestations are usually very severe, and abortion may occur. Should she become infected from her child during the period of gestation she generally shows only mild secondary lesions, with of course the possibility of

tertiary ones developing later. Many authorities deny that this method of infection ever occurs.

If a woman who has already contracted the disease become pregnant she invariably aborts; this occurs in the latter half of the period of gestation. It must, however, be remembered that foetal syphilis inherited from the father may also lead to abortion, and that should a child with this congenital form of the disease be born the mother, who has shown no signs of syphilis herself, can nurse it without fear of infection (Colles' law). In these circumstances it is, of course, extremely probable that the mother has had the disease in a mild form or in some way become protected (? vaccinated) against it.

The full relationship of parental syphilis to the child, and the questions of maternal infection and immunity, are, however, as yet incompletely understood.

Treatment of syphilis.—Mercury is the specific remedy for the early manifestations; and for the tertiary lesions mercury intermittently with the iodides of potassium, sodium and ammonium, or with the organic iodine preparations, such as iodipin. The salts of sodium and ammonium are better tolerated than potassium iodide to which they are therefore preferable.

Mercury may be given by the mouth, by inunction, fumigation or by intramuscular injection. In the ordinary way it is most conveniently given orally, great attention being directed to the state of the mouth. The teeth should be kept clean, and the mouth frequently examined, in order to guard against mercurialism.

When, however, it is desirable to get the patient under the influence of mercury quickly intramuscular injections of grey oil (10 minims) in the form of Lambkin's cream[1] should be given.

Locally, the ordinary *lotio nigra* may be applied to vulval lesions, and a dusting powder of calomel and starch used to keep the parts dry, especially when there are condylomata. If there be a primary chancre of the cervix, or it be necessary to treat a pregnant woman, the following method of Riehl is an excellent one. An ointment is made of equal parts of lanoline and lard with 15 per cent. of mercury; three grammes of this are applied daily to the cervix. If there be difficulty about the daily application five grammes should be applied every other day. This preparation is kept in position by a tampon of wool impregnated with two parts of glycerine to one part of tannin, so that it will not absorb the ointment.

[1] Lambkin's cream.—Mercury, 10 gms. 'Creo-camphor,' 10 c.cm. Palmitin basis, 100 c.cm.

§ iv. SOFT SORE.

The soft sore was formerly considered to be a syphilitic lesion. Ducrey has, however, isolated a bacillus which is generally recognized as being responsible for this special infection.

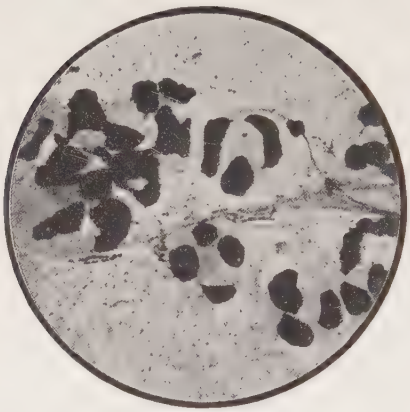


Fig. 189.—Ducrey's bacillus in a 'smear' from a soft sore. Two groups of organisms arranged in chains can be seen across the middle of the field. ×900. (*Photomicrograph.*)

The organism can be stained with basic aniline dyes but is readily decolourized. Cultivations have been made by using a mixture of rabbits' blood and agar for the medium.

The bacilli when examined microscopically are seen to occur as minute oval rods, which are arranged in chains (fig. 189). The lesion itself appears clinically as a small, round, raised vesicle ('soft chancre'), which suppurates and breaks down, leaving a clean cut ulcer; in time granulations give rise to a slightly fungating sore with a soft base. These lesions are multiple as a rule. The inguinal glands are frequently affected, and suppurate when the sores are infected with pyogenic organisms.

Treatment consists of applying strong antiseptics to the sores, and of surgical attention to any bubo there may be in the inguinal region.

§ v. SEPTIC INFECTION (Staphylococcus and Streptococcus).

Staphylococci and streptococci are known as pyogenic bacteria, and one or other variety, or both together, may be found in most cases of septic infection.

Staphylococci exist in several varieties; the two commonest are known as the 'aureus,' from the golden colouration of the colonies grown on agar, and the 'albus' which is devoid of colour when cultivated. These organisms like the streptococci stain readily with basic aniline dyes, and are not decolourized by Gram's method. Under a high power magnification staphylococci are seen to arrange themselves in clusters or groups (fig. 190).

Streptococci, when stained with a basic aniline dye and examined under a high power of the microscope, are seen to arrange themselves in chains (fig. 191). There are, however, many varieties and involution forms. Streptococci are somewhat difficult to cultivate artificially,

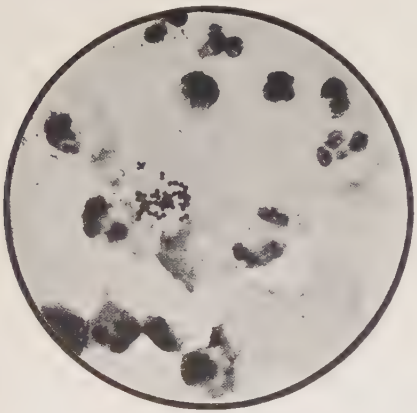


Fig. 190.—Staphylococcus pyogenes in pus. A cluster of the organisms can be seen near the centre of the field. ×900. (*Photomicrograph.*)

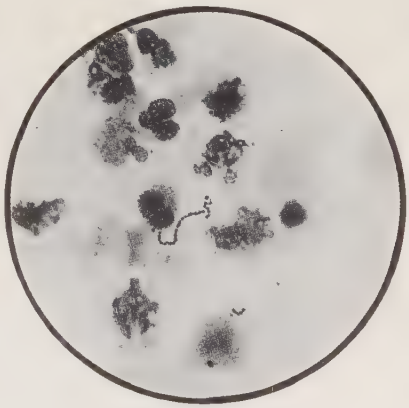


Fig. 191.—Streptococcus pyogenes in pus. One long chain is seen with another crossing the end at right angles. Below this there is a small comma-shaped chain with about four cocci. ×900. (*Photomicrograph.*)

but this can be accomplished when the organisms are active if a medium of broth be used; in this medium the colonies form small flocculi, or produce a diffuse turbidity.

As already indicated, either staphylococci or streptococci, or both together are usually found in septic lesions of the genital tract, very often associated with the bacillus coli communis or the gonococcus. Generally speaking, it may be said that the more virulent affections and those which tend to become generalized are due to the streptococcus, while lesions produced by the staphylococcus tend to remain local.

These organisms, therefore, play an important part in the infections that arise (1) after operative procedures; (2) after parturition; (3) complicating new growths; (4) spontaneously on the external genitals.

It is hardly necessary to detail the consequences that may arise as the result of septic infection during operative procedures. Antiseptic and aseptic methods have largely banished these sequelae to surgical intervention. When an operation is undertaken for a septic condition, such as a sloughing fibromyomatous polyp, infection of any laceration of the cervix or incision made by the operator is very liable to follow and may ultimately lead to cellulitis.

When infection does occur in this way the condition created—a localized abscess or general infection—must be treated on ordinary lines; this may involve the use of sera, vaccines or other routine therapeutic measures.

SEPTIC INFECTIONS FOLLOWING PARTURITION.—Infections and toxaemias arising as sequelae to parturition are common, but here we are only concerned with those which come under the observation of the gynaecologist. *Phlegmasia alba dolens* and acute general septicaemia fall, strictly speaking, into the province of the obstetrician. Those infections, however, which may require surgical intervention may be considered gynaecological and worthy of some consideration. They may be classified in the following manner:

(*a*) Local infection of the uterus.
(*b*) Local pelvic infection.
(*c*) General peritonitis.

(a) **When the infection is localized in the uterus**, it may be staphylococcal or streptococcal, or due to the bacillus coli communis, or be a mixed infection. The first pathological condition that arises is septic endometritis. The endometrium is invaded by the organisms, and there is reaction on the part of the tissues with round cell infiltration (fig. 192).

When the wall of the uterus is deeply infected abscesses may be formed or the mucosa may slough. In such advanced cases there is usually extension, beyond the uterus, to the cellular tissue and pelvic peritoneum.

Symptoms.—The onset is sudden and often accompanied by a rigor. There is an irregular pyrexia, with increased pulse rate. As a rule the lochia cease entirely, and there may be no discharge, at anyrate unless sloughing occur. Vomiting is frequently present, and often diarrhoea.

In the early stages the general symptoms are those associated with any septic infection; later, the local signs of inflammation in the pelvis arise. Sometimes the condition rapidly passes into one of general septicaemia, and the patient dies before marked lesions have had time to occur in the uterus.

When there is definite inflammation of the uterus, possibly with the formation of abscesses in the wall, the organ is found to be large and tender. An intrauterine examination reveals infiltration of the walls, and possibly sloughing of the endometrium. Should the patient recover from an acute puerperal infection of the uterus a chronic fibrosis of the endometrium and muscle wall is almost certain to supervene.

Fibrosis of the uterus.—Owing to the large amount of attention directed lately to the question of the fibrotic uterus it will be as well to discuss the subject here, since the vast majority of cases are mainly attributable to infection of the uterus subsequent to parturition or abortion, and are therefore of the nature of a chronic metritis. The

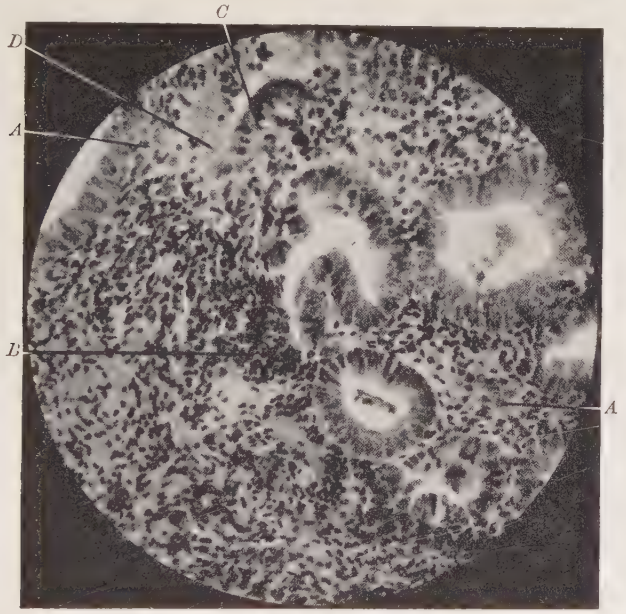


Fig. 192.—Acute inflammation of the endometrium. ×200. (*Photomicrograph. J. Macgregor, 'Study of the Endometrium.'*)

A. Normal stroma cells. *B*. Aggregation of leucocytes invading and destroying the glands. *C*. Remains of a gland. *D*. Haemorrhage.

term '*fibrosis uteri*' is applied to the large, hard uterus found in women usually about thirty-five or forty years of age. As already stated the symptoms associated with this condition are leucorrhoea, menorrhagia, and occasionally metrostaxis; sometimes there is dysmenorrhoea. The increased weight of the uterus may also be said to predispose to prolapse, although this does not occur so often as might be supposed, owing to the very frequent position of uterine anteflexion found in this condition.

Histologically the walls of the uterus are seen to be largely composed of fibrous tissue, and the arteries are exceedingly thick walled. The endometrium is almost always in a condition of glandular hypertrophy, which is really an early stage of adenomatous growth. The glands are large and dilated—a condition almost invariably associated with bleeding (see p. 305).

Now the etiology of these changes is interesting. The condition is rarely seen in women under thirty-five, and practically never in nulliparae: that is to say unless there have been an acute (gonorrhoeal) infection of the muscular walls of the uterus, and this, as already stated, is most unlikely to happen—if it ever do happen—in any but a recently pregnant organ.

But with multiparae, and to a less degree in those who have had one child, the case is very different. We know that mild degrees of infection are fairly common after parturition, especially in the poorer classes, in whom *fibrosis uteri* is more usually seen. Further, we know that streptococcal and staphylococcal infections do not remain limited for long to the lining membrane either of the uterus or tubes as does gonococcal infection; consequently the inflammatory process soon spreads to the walls of the uterus, where, perhaps, it remains without extending to the peritoneum.

The process will be more easily appreciated when we bear in mind the vulnerable condition of the uterine walls after parturition.

Apart, however, from the parity of the patient it must be remembered that this process is found most marked towards the menopausal period of life, when, as we have already seen, fibrosis naturally occurs. So that there are really three factors at work: the hyperplasia of muscle tissue due to pregnancy; on the top of which comes an infection, which in the chronic stage leads to a fibrosis in the muscle wall; and this process is, moreover, no doubt increased by the natural fibrosis occurring about the menopause.

Treatment of infections of the uterus.—If there be no evidence of general septicaemia—that is to say if the blood be sterile—we must consider the question of surgical intervention.

In mild cases it is sufficient to remove any infected products of conception there may be within the uterus, and to swab out the interior of that organ with a solution of iodine (10 per cent.) and subsequently irrigate with a weak solution of the same chemical (Tinct. iodi ʒij Aqua Oj).

In severe cases, when we are able to recognize that it is the infection of the uterus itself which is the main source of disturbance, it is advisable to remove this organ by abdominal or vaginal hysterectomy. If the state of the patient warrant the procedure abdominal hysterectomy is the better, as it enables the operator to attend to any extrauterine lesions which may complicate the condition. The question of removal of the uterus in all severe puerperal infections is one that frequently arises. Considerable difficulties in forming an

opinion present themselves. As a rule the time at which removal of the uterus would put an end to the disease is not that when one could possibly say how the disease was going to progress; and conversely, when the disease has become general (septicaemia) it is too late to remove the uterus. Consequently it is best to restrict the removal of the uterus to those cases in which there are definite and extensive inflammatory changes, with sloughing or the formation of abscesses in the wall.

In septicaemia the uterus itself may be but little affected, the organisms having 'gone through' into the general circulation.

In chronic fibrosis of the uterus palliative treatment is of little avail. When the menorrhagia or metrostaxis is severe hysterectomy should be performed.

(**b**) **Local pelvic infections** may be anatomically and clinically divided into:

1. Cellulitis (parametritis).
2. Salpingitis, oöphoritis and pelvic peritonitis (perimetritis).
3. Thrombo-phlebitis.

These may all result by extension from an infected injury of the cervix, vagina, or uterus. In some cases the uterus may be uninjured, and it is the placental site which is the source of infection—the organisms being conveyed directly to the tubes, or to the cellular tissue *viâ* the lymphatics. In some cases the above mentioned anatomical varieties may be found coexisting; but it will be simpler to consider them separately here.

Cellulitis.—This is most commonly found with lacerations of the cervix which have become infected. For the most part the cellular tissue of the pelvis occupies the broad ligaments, and it is here that pelvic cellulitis is most commonly seen. Sometimes the cellular tissue lining the wall of the pelvis is also involved.

Symptoms and **progress.**—Puerperal cellulitis commences with a rigor a few days after parturition; this is followed by a more or less irregular temperature. There is little acute pain, consequently in mild cases the condition escapes detection until the patient gets out of bed and walks about, when a dull, aching pain in the back, and a sense of weight in the pelvis cause her to seek advice.

Occasionally, however, the patient is very ill from the first, with all the symptoms of acute septic infection. In this latter type of case suppuration usually occurs; while in the former resolution and cicatricial contraction are the rule.

When suppuration supervenes the cellular tissue is generally extensively involved, and frequently also the pelvic peritoneum. The

exudation spreads up over the brim of the pelvis and the abscess usually points above Poupart's ligament.

Physical signs.—On abdominal examination one can often feel, and frequently see, a large rounded swelling rising out of the pelvis. In slight cases the cellulitis is limited to the pelvis, and nothing abnormal is to be seen or felt.

On making a bimanual examination one is at once struck by the marked fixation of the pelvic organs. The uterus, which cannot be moved at all, is usually displaced to one side or the other. Sometimes on both sides an extensive exudation into the cellular tissue is to be felt obliterating the vaginal fornices. This exudation usually commences in the broad ligaments, and it may spread forwards to the tissues between the uterus and bladder.

With a finger in the rectum it may be possible to get behind the lateral swelling, and in this way to make out that on the posterior aspect it is bounded by the posterior layer of the broad ligament.

Diagnosis.—This is not difficult as a rule, when there is a history of a recent inflammatory attack—which may still be persisting—especially in connexion with a full term parturition or an abortion. In those cases in which all acute symptoms have disappeared, and in which the exudation has to a large extent been absorbed, leaving thickened tissues in the neighbourhood of the uterus, a diagnosis can be made from fibromyoma uteri—the only condition likely to be confused with the result of cellulitis—by noting the fixation of the uterus in the neighbourhood of the thickening, and also by the diffuse character of the swelling as compared with the definite outline of a fibromyomatous growth.

Treatment.—In a large majority of cases the only treatment required is rest in bed, and the employment of hot, antiseptic vaginal douches and fomentations on the hypogastrium. After a varying period of many weeks or months complete absorption may occur, even when a large mass has been palpable in the abdomen. Great care must always be taken to keep the bowels acting freely.

When resolution does not take place pus forms and the abscess presents, usually in one or other inguinal region, more rarely in the vagina or perineum. Occasionally the abscess discharges into the bladder or large bowel.

As soon as an abscess has formed, and can be located, it should be evacuated. By this time the incision, if it be through the abdominal parietes, is effected extraperitoneally; and the operation rarely involves more than making an opening straight into the abscess cavity, and inserting a large drainage tube.

An indication of the formation of pus can nearly always be obtained from the leucocytosis which is present in the blood in these circumstances.

Salpingitis, oöphoritis and peritonitis.—When the appendages and peritoneum become involved in a puerperal infection symptoms of an acute character are produced. The physical signs and symptoms are much the same as those of acute gonorrhoeal infection and therefore need not be recapitulated (see p. 247). Almost invariably in these cases a pelvic abscess is formed, and very often the patient dies from the virulence of the general infection. Pathologically it is found that puerperal infections do not remain for long localized in the mucous membrane of the tubes, as with gonococcal infection, but tend to spread rapidly along the lymphatic channels.

Treatment.—If the condition be limited to the pelvis interference is inadvisable, unless there be some definite indications that good can be accomplished. There is very great danger in at once attacking the disease by the abdominal route, for in this way the general peritoneal cavity may be infected. During the first few days hot fomentations should be applied to the abdomen and hot antiseptic vaginal douches given. If the infection—which may present all the symptoms of pelvic peritonitis—do not subside, and an abscess form, this should be opened and drained through the posterior vaginal cul-de-sac.

If necessary, the damage done to the tubes can be investigated by the abdominal route, and attended to, later, after the parts have had time to recover from the acute infection. It must not be forgotten, however, that staphylococcal and streptococcal infections do not destroy the mucous surfaces of the tubes in the way that gonococcal infections do; consequently complete functional recovery may occur after puerperal infection.

Thrombo-phlebitis of the pelvic veins.—This sequel to puerperal infection is very common, either alone or in conjunction with cellulitis and salpingo-oöphoritis.

The organism found is the streptococcus pyogenes.

It has been shown recently that in at least one half of the cases that die of acute puerperal infections, the only lesion to be found is thrombo-phlebitis of the ovarian and hypogastric veins, and the results of this—septic thrombosis and pyaemia.

The subject is, therefore, one of considerable interest in regard to diagnosis and treatment.

Symptoms and diagnosis.—The diagnosis is a somewhat difficult matter at present, since the condition has only recently attracted attention; but as the successful treatment is based on immediate surgical intervention, an early diagnosis is of considerable importance.

This lesion always commences early in the puerperium—usually within the first few days.

The onset is marked by a rapid rise of temperature and often by a rigor; the pulse rate is very rapid (130 beats a minute or more). The patient has no pain. As the disease advances she becomes profoundly poisoned, and her condition ultimately passes into one of pyaemia, with rigors and a hectic temperature, if she do not die before. On examination the abdomen is found to be flaccid, and not at all tender on palpation. On bimanual palpation the uterus may be felt to be enlarged; or it may be well involuted in accordance with the time that has elapsed since parturition.

There is no tenderness of the organ, nor in the vaginal fornices, a point of great practical importance, indicating, as it usually does, that the focus of infection is not situated in the uterus. Further, no local exudation (cellulitis) nor pelvic adhesions (peritonitis), as indicated by fixation of the uterus or the presence of pelvic swellings and tenderness, can be made out. In some cases a careful rectal examination will enable the practitioner actually to feel the thrombosed veins in the pelvis. He should make the examination very carefully lest he disturb any clots that may be present.

On inspection a tear may be found in some part of the vagina or cervix, through which the organisms have gained admittance. In some cases there is no tear, and infection has taken place through the placental site.

The cervix may be seen to be of a very dark purple hue; and this when it is found a week or more subsequent to labour is of considerable diagnostic importance as an indication of serious thrombosis. There is usually no discharge from the uterus.

Thus by a process of exclusion of other local foci, and by the positive facts conveyed by the nature of the attack—temperature, rigors, and increased pulse rate, together with the cyanosis of the cervix, and possibly vagina—we are in the position to make a fairly definite diagnosis. It is necessary, of course, always thoroughly to examine the heart, chest and urine, to exclude obvious lesions such as endocarditis and pyelitis, which may be present and give a somewhat similar train of general symptoms.

Pathology.—The pathology of the condition is simple. Thrombosis occurs in the veins as the result of septic infection. The clots are at first aseptic but soon become invaded by streptococci, and break down with the formation of pus in the interior of the vein, the wall of which becomes converted into granulation tissue (fig. 193).

The vessels most frequently implicated are the ovarian: the arteries as well as the veins may be involved. If these vessels alone be

affected, a banana-shaped mass is formed along the top of the broad ligament on one or both sides. This mass consists of the infected vessels and perivascular tissue into which exudation has occurred. Often the lesion extends right up to the junction of the ovarian vein with the inferior vena cava or renal vein. When the internal iliac, or any of its divisions, is thrombosed, the mass of affected veins occupies the lateral wall of the pelvis and the base of the broad ligament.

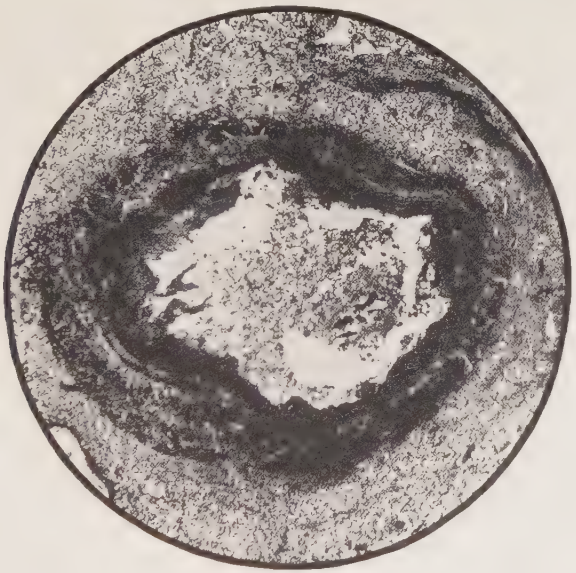


Fig. 193.—Section of a thrombosed ovarian vein removed by operation from a case of puerperal sepsis. The wall of the vein is converted into granulation tissue, and there is pus in the interior. ×15. (*Photomicrograph.*)

As already stated, pyaemia is often the sequel to this lesion, just as it follows septic infection of the lateral sinus and jugular vein in middle ear disease.

Treatment.—This has only been seriously considered to be practicable of quite recent years. Previously cases were treated on general and expectant lines; almost all dying of pyaemia. In regard to those said to have recovered, it is doubtful whether purulent thrombo-phlebitis ever existed.

Having in view the fact that the internal jugular vein was always tied to prevent the extension of infection from the lateral sinus in middle ear disease, certain pioneers advocated ligation and excision of the veins in puerperal thrombo-phlebitis. Up to the present the cases that have recovered have certainly been of a subacute type. But with earlier recognition of the condition acute cases will undoubtedly be saved.

Before leaving the subject of thrombo-phlebitis it may be as well to state, without dealing further with the condition, that thrombosis of the femoral vein may occur as a somewhat chronic affection, leading to the condition known to obstetricians as *phlegmasia alba dolens* (white leg). Sometimes, however, 'white leg' is caused by blocking of the lymph channels from the lower limb. The left leg is the one usually affected.

(c) **General peritonitis** sometimes follows acute puerperal infections. It is produced by extension of the infective process from the uterus, or more commonly from the Fallopian tubes.

The **symptoms** are unmistakable. The whole abdomen becomes rigid; the pulse rate rises; the temperature often drops, and the patient's general condition becomes desperate—sometimes she is so ill that there is apparently no pain. Free fluid can often be detected in the abdomen. A fatal termination is practically invariable.

Treatment consists of attempting to arrest the disease with sera; by the use of continuous saline solution, and by free abdominal drainage with the patient in Fowler's position (see p. 430).

In operating upon these cases one is always careful to avoid doing more than making an opening into the abdomen. Local anaesthesia should be employed whenever possible.

INFECTION OF NEW GROWTHS.—All new growths that outgrow their blood supply, have that supply interfered with, or break down—as is the case with malignant growths—are extremely liable to become infected with pyogenic organisms. The sloughing or abscess formation which occurs is the obvious local lesion, while the patient suffers constitutionally from the toxaemia that results from the activity of the septic organisms. This is well seen with cancer of the cervix or with the sloughing of a submucous fibromyoma, when the patient may be affected to a marked extent by septic absorption.

Antiseptic principles form the basis of treatment if eradication of the disease itself be impracticable.

INFECTION OF EXTERNAL GENITALS.—Staphylococcal infection of the vulva is seen in the suppuration that occurs in sebaceous glands (boils); in the suppuration of wounds, of Bartholin's cysts and of haematomata.

Vulvo-vaginitis of children, which may often be ascribed to want of cleanliness, is in many cases due to staphylococcal infection, and this, although somewhat obstinate, is as a rule more amenable to antiseptic treatment than the gonococcal infection.

Streptococcal infection is sometimes seen as a more or less pure lesion in 'membranous ulcers,' which may be found within the labia majora. This condition must be distinguished from diphtheria of the part. The membrane found in streptococcal infection is not fibrinous, but a definite slough.

The ulcerated area must be treated on ordinary antiseptic lines.

§ vi. SEPTIC INFECTION (Bacillus coli communis).

This bacillus normally inhabits the large and small intestine. For microscopical examination the bacilli may be stained with carbol-thionin-blue, or with Ziehl-Neelsen carbol-fuchsin diluted with five parts of distilled water; they are decolourized by Gram's method. The organisms are short bacilli with oval ends showing bipolar staining (fig. 194), and possess lateral flagella which are responsible for their motility. Cultures may be made on agar at a temperature of 37° C. and a distinctive growth of red colonies is obtained by growing the bacillus on plates of agar and neutral red.

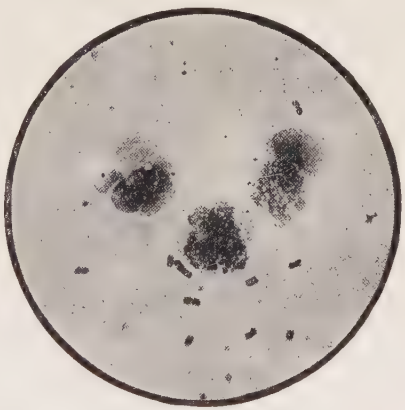


Fig. 194.—Bacillus coli communis. Obtained by centrifuging the urine from a case of cystitis. ×900. (*Photomicrograph.*)

Since the organism occurs naturally in the bowel it will be readily understood that women may become infected in many circumstances. When the bacillus coli communis attacks previously healthy tissues an acute inflammatory reaction is produced, and this may lead to suppuration.

The genital organs are infected in two ways:

(1) By the ascent of the bacilli *viâ* the vagina.
(2) By infection from the bowel in the abdomen.

Infection viâ the vagina.—It is doubtful if the genital organs become infected by the bacilli ascending the vagina in normal circumstances; but if there be a recto-vaginal fistula, with faecal material constantly in the vagina, there is no doubt that an infected condition of the endometrium, or even of the Fallopian tubes, may result.

Ordinarily, however, when infection occurs it is by an ascending process after parturition—especially if intrauterine manipulations have

been carried out without adequate aseptic technique. The proximity of the rectum and the escape of faeces are predisposing factors which it is the duty of the obstetrician to guard against. Laceration of the vagina and perineum—especially when the bowel is torn into—is also commonly associated with infection by the bacillus coli communis. If the interior of the uterus be infected the gravest symptoms of puerperal infection may arise. These must be dealt with on the lines already laid down in regard to the other septic infections.

Infection from the bowel in the abdomen.—This may occur:

(*a*) As a primary lesion so far as the genital organs are concerned.

(*b*) As a secondary lesion.

Primary lesions of the genital tract occur in cases of *appendicitis* in which the appendix is situated in the pelvis. Should suppuration occur it may involve the right tube and ovary or even the whole pelvic contents in the infective processes. In the first case the appendix may become glued on to the tube of the right side and perforate into it, forming an appendiculo-tubal abscess; or, if no perforation occur, a periappendiculo-tubal abscess may be formed.

In the second case the whole pelvis may be infected, and all the organs bound together by inflammatory adhesions.

Again, it is not uncommon to find the genital organs, especially on the left side, infected from the sigmoid colon—*sigmoiditis sinistra* is now a well recognized entity. This may give rise merely to inflammatory adhesions, or a definite abscess (extratubal) may form on the left side as in the case of appendicitis on the right side.

Secondary lesions, or infections, are produced by the bowel becoming adherent to inflamed tubes and ovaries, ectopic pregnancies or to growths, especially when the vitality of the latter is impaired by torsion. An exodus of the bacteria takes place from the bowel to the diseased structures, and suppuration almost invariably follows.

Treatment.—Laparotomy is indicated in all these cases. The details of technique depend upon the conditions found. It must be pointed out that in all infections by the bacillus coli communis, autogenous vaccines have been found to be of considerable value as an auxiliary means of treatment.

§ vii. SEPTIC INFECTION (Pneumococcus).

Infection of the genital tract by the pneumococcus is extremely uncommon, but does sometimes occur in association with pneumococcal peritonitis, or after parturition. It is important, however, in puerperal

cases to remember that within the uterus an involution form of streptococcus (a diplococcus) is often found. The pneumo-diplococcus, however, has a capsule which with basic aniline dyes remains unstained, or at any rate is not so deeply stained as the organism itself.

The pneumococcus is somewhat difficult to cultivate, but it grows best on blood serum.

§ viii. TUBERCULOSIS.

Tuberculosis of the genital tract is not unusual, and may be found as a primary, or secondary, lesion.

The bacillus stains satisfactorily only with strong solutions, of gentian violet, or fuchsin with carbolic acid. The best method is that known as Ziehl-Neelsen (carbol-fuchsin). Once stained the bacillus is not easily decolourized. The organism is best cultivated in glycerine broth at 37° C., but grows slowly. When stained and examined under a high power of the microscope it is seen to be a slender non-motile rod-shaped organism, appearing sometimes slightly curved. In the infected tissues the bacilli are irregularly scattered in little clumps. The organisms themselves are usually isolated, but two organisms may be attached by the extremities and form an angle with one another (fig. 195). It is important to remember that the smegma bacillus resembles the tubercle bacillus in appearance and staining reactions, and may, therefore, be mistaken for the latter.

Fig. 195.—Bacillus tuberculosus. In the illustration, which is taken from a 'smear' preparation, the bacilli are seen to be clustered in one or two places; in other parts of the field two bacilli lying together form an angle one with the other. Some of the organisms are seen to be curved. ×900. (*Photomicrograph.*)

TUBERCULOSIS OF THE VULVA.—This is extremely rare. It may occur as a definite eaten-out tuberculous ulceration, and is often associated with tuberculous disease of the genital tract higher up; sometimes it may be found in the form of lupus.

TUBERCULOSIS OF THE VAGINA is also rare, but it may be associated with tuberculosis of the cervix or of the body of the uterus.

The disease may be primary, but it is generally secondary. The ulceration of the vagina is of the usual undermining character in appearance; and clinically it may be associated with recto-vaginal or vesico-vaginal fistulae.

TUBERCULOSIS OF THE UTERUS.—This is not uncommon in the body of the uterus in conjunction with tuberculous salpingitis. The muscle walls may contain abscesses (fig. 196); or it may only

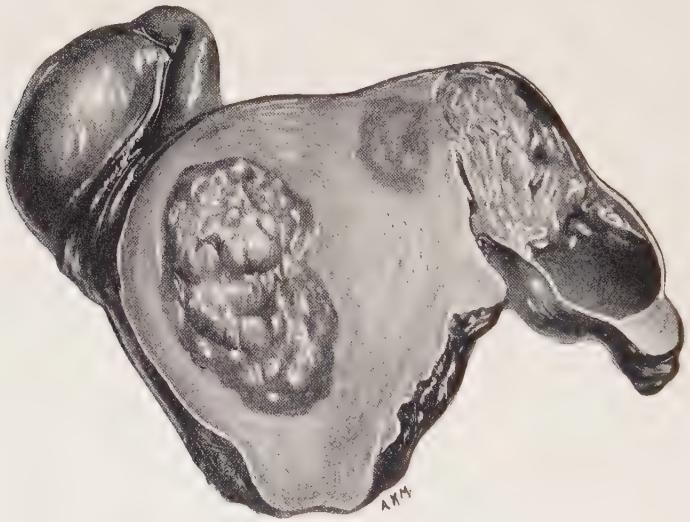


Fig. 196.—Tuberculous uterus and Fallopian tubes from a young woman who had never menstruated. An abscess is seen in the left half of the uterus; and the right tube, which is also seen in section, contained inspissated pus, some of which has dropped out.

be the endometrium which is affected and ulcerated. As already mentioned, tuberculosis of the cervix is usually found associated with tuberculosis of the vagina. This form of ulceration of the cervix and vagina must be distinguished from the carcinomatous by bacteriological and histological investigation.

TUBERCULOSIS OF THE FALLOPIAN TUBES is quite common. The disease is found as a primary affection, or secondary to general tuberculous disease of the peritoneum, or very exceptionally to lesions in the lungs and elsewhere. When the disease is secondary to general peritoneal infection the condition is only indirectly one of gynaecological importance, for the tubes are merely infected on the peritoneal surface by miliary tubercles in the same way as the rest of the peritoneum.

When, however, the tubes contain the primary focus, as is some-

times the case in tuberculous peritonitis, the subject becomes one of considerable importance.

This condition may arise at any age, and it is not uncommon to find tuberculous salpingitis *post mortem* in children, or to meet with the results of it—pelvic adhesions and sterility—later in life.

The commonest form in which the gynaecologist encounters the disease is as a chronic salpingitis with pyosalpinx.

Sometimes the infection is mixed, for there is no doubt that gonococcal infection predisposes to the invasion by tubercle. The tubes which are usually greatly thickened, distended and convoluted may be studded with tuberculous deposits (fig. 197), but more

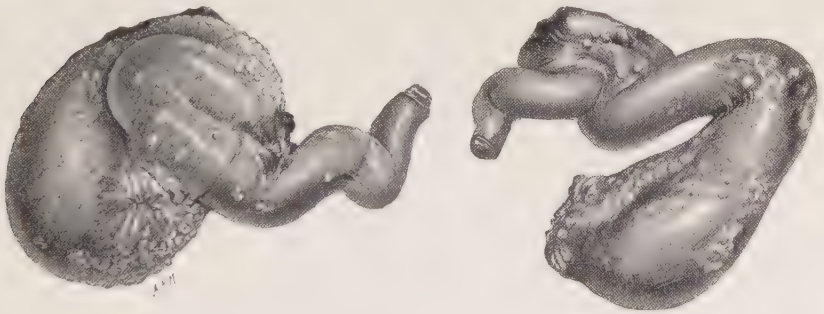


Fig. 197.—Tuberculosis of the Fallopian tubes. The condition was one of double tuberculous salpingitis which was associated with general tuberculous peritonitis. Miliary tubercles are seen on the peritoneal surface of the tubes.

frequently they are not to be distinguished with the naked eye from those infected with gonorrhoea—that is, in the absence of tuberculous infection of the general peritoneal cavity. On microscopical examination giant cells, which are always found in tuberculous lesions, are readily seen (fig. 198). In favourable cases the bacilli also may be stained *in situ*.

The **signs** and **symptoms** are very much the same as those associated with similar conditions arising from gonococcal infection. In tuberculous disease, however, there is often a hectic temperature, and sometimes a phthisical family history.

TUBERCULOSIS OF THE OVARY occurs in association with tuberculous salpingitis, but the ovaries frequently escape infection even when the tubes are involved.

TUBERCULOSIS OF THE PERITONEUM is discussed in Chapter XIV., p. 408.

Treatment of tuberculosis of the genital organs.—All tuberculous lesions must be removed when possible.

Ulcers on the vulva and in the vagina should be excised or scraped; infected uteri and tubes should be removed. As a rule the

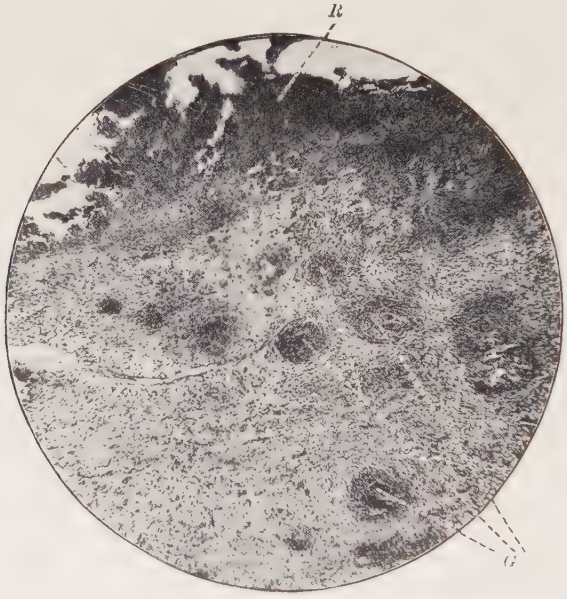


Fig. 198.—Tuberculous salpingitis. The lumen of the tube—seen in the upper part of the picture—is lined with breaking down granulation tissue (*R*); subjacent to this are many giant cell systems (*G*). The whole tube is infiltrated with small round cells. ×100. (*Photomicrograph.*)

ovary can safely be left unless it shows definite signs of infection; this, however, as already mentioned, is not by any means always the case.

In regard to operative procedures within the abdomen, experience teaches us only to do what is absolutely necessary, and to do everything as carefully and gently as possible.

If the bowel be adherent very grave risks are incurred in the separation of it, for faecal fistulae readily follow, and in the majority of cases associated with tuberculous disease have ultimately a fatal issue, after the patient has been through months of suffering. For this reason, also, gauze packs and dabs should be moistened with normal saline solution, and the intestines 'packed off' with all possible gentleness; and drainage should never be employed. In removing tuberculous tubes, if the uterus be not removed at the same time, a wedge shaped piece should be excised from each uterine cornu with the tube, since the disease frequently extends to the wall of the uterus.

In dealing with tuberculous lesions in the pelvis, adventitious cyst walls and adhesions must never be separated or disturbed—except in so far as is inevitable in the removal of the primary focus. Extensive peritoneal denudation may, and frequently does, lead to generalized tuberculosis.

Tuberculin treatment should be systematically carried out with or without operative treatment in suitable cases, and all the other routine general methods of treating tuberculous patients with fresh air, good food and graduated exercises adopted.

§ ix. GAS-FORMING INFECTION.

The organism responsible for this condition (bacillus aërogenes capsulatus) has been found in cases of puerperal infection. Gas is rapidly produced in the infected tissues, such as the uterus, which may become gangrenous. When invasion of the circulatory system occurs bubbles of the gas are formed in the blood vessels. The liver, also, is found *post mortem* to be riddled with cavities caused by the development of gas, thus resembling Gruyère cheese.

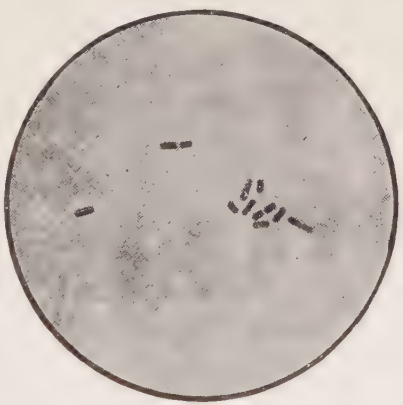


Fig. 199. Bacillus aërogenes capsulatus in a blood 'smear.' ×900. (*Photomicrograph.*)

The bacillus aërogenes capsulatus stains readily with basic aniline dyes, while the capsule remains unstained (fig. 199). It is not decolourized by Gram's method. The organism grows well anaërobically on agar under the usual conditions of temperature. If sugar be added to the agar, or sugar-gelatine be used, the culture medium is broken up by the formation of bubbles of gas.

Occasionally the bacillus coli communis produces gas in infected tissues, but not to any great extent.

§ x. DIPHTHERIA.

The diphtheria bacillus is sometimes found as an accidental infection of the vulva, especially in children who are suffering from diphtheria of the fauces. A typical membranous patch is produced from which the Klebs-Löffler bacillus may be obtained. It is important to remember

that the streptococcus produces a slough which may be mistaken for a diphtheritic membrane.

The bacillus may be stained in the membrane with methylene blue. The organisms are then seen to be in the form of slender straight or slightly curved rods. The diphtheria bacillus grows fairly readily on blood serum.

Treatment consists of antiseptic applications locally, and the injection of diphtheria antitoxin.

§ xi. TETANUS.

After operation, or after parturition, tetanus sometimes supervenes owing to accidental contamination with the tetanus bacillus. In regard to parturition careful antiseptic precautions can prevent infection. In respect to operative procedures it is somewhat disconcerting to know that tetanus sometimes follows even the most rigid aseptic conditions. Lately attention has been directed to the subject, and it has been suggested that the catgut contains the organism which produces the symptoms of tetanus; and that this organism is not the true tetanus bacillus, but that which produces the disease known as 'louping-ill,' in sheep. It is from sheep that catgut is prepared, and if this hypothesis be true it only makes it the more necessary to sterilize the gut by some heating process such as that known as Bartlett's (see p. 444).

The tetanus bacillus, when stained with gentian violet, is seen to be like a drumstick in shape, the head being formed by a spore, but its forms are somewhat variable. It possesses flagella, and is slightly motile. The bacillus grows well on glucose gelatine in anaërobic conditions.

The symptoms of tetanus are too well known to need description here. Recently excellent results have been obtained by the combined use of antitetanic serum administered hypodermically, and chloretone (60 grains dissolved in hot oil) *per rectum*. The chloretone is repeated when necessary. This drug appears entirely to control the spasms, and it is in itself innocuous. If the rectum be intolerant it should be administered by the stomach tube with the patient under the influence of an anaesthetic.

§ xii. TYPHOID INFECTION.

During the course of typhoid fever ulcers on the vulva may occur, and are directly due to infection by the typhoid bacillus. These

ulcerations must be treated on ordinary antiseptic principles. Recently, too, cases have been reported in which ovarian cysts have been infected by the typhoid bacillus, and have suppurated. This may take place long after the disease itself has subsided; for it is now well known that certain individuals can harbour the typhoid bacillus many years after they have recovered from the disease itself, and that the organisms may be found in lesions in many parts of the body. Any infection of doubtful origin in the genital tract of a woman who has had typhoid fever should be carefully investigated by a competent pathologist, in order to determine the presence or absence of typhoid bacilli.

The bacillus typhosus can be stained by the Ziehl-Neelsen (carbol-fuchsin) method. In appearance the organisms are oval-shaped, with flagella which cause them to be actively motile. The cultures in peptone gelatine give a characteristic appearance. For the differential cultural reactions of the bacillus coli communis and the bacillus typhosus a manual of bacteriology must be consulted.

§ xiii. ELEPHANTIASIS ARABUM.

True elephantiasis is rare except in tropical countries, where it is not uncommon. When the vulva is affected enormous tumours may be formed; in some cases these have been known to reach to the ground. The disease is produced by the blockage of the lymphatics of the parts by the adult worms (Filaria sanguinis hominis) which cause the disease, or by masses of their ova.

§ xiv. ACTINOMYCOSIS.

This disease is produced by the actinomyces or ray fungus. The organisms, which occur in naked-eye colonies, may be stained with any basic aniline dye, after breaking down the clumps; they are not decolourized by Gram's method. Typically these organisms show a radiating disposition and are individually of filamentary shape (streptothrix). They can be grown with difficulty anaërobically on agar. Although cases have been reported in which this condition has been found in almost all parts of the genital system, it is only very rarely that the lesion is primary. The course of the disease is exactly the same here as in other parts of the body. If on the vulva, rapid destruction of tissue with suppuration and burrowing sinuses may be seen. The collections, or colonies, of the actinomyces which are visible to the naked eye may be detected in the pus as small gritty, yellow

particles, the size of a pin's head. If the tubes and ovaries be affected adhesions rapidly form, and considerable difficulty will be experienced in making a diagnosis—malignant disease having been usually suspected.

Complete removal by excision is necessary; and iodides should always be administered internally as auxiliary treatment.

§ xv. HYDATID DISEASE.

The echinococci which produce hydatid disease are the larvae of the taenia echinococcus, a small cestode found in the intestine of the dog and other animals. The embryo, which has six hooklets, is freed from the ovum by the digestive juices, and may reach any part of the body by burrowing through the intestinal wall. Frequently it reaches the liver by way of the portal system. When the embryo has arrived at what is to be its destination the hooklets disappear, and it is converted into a cyst with an outer adventitious and an internal true cyst wall. From the parent cyst, daughter and granddaughter cysts are formed, until a colony of cysts is produced.

This is the form assumed by hydatid disease in man. The recognition of the disease is made clear by the way in which the pearly white internal cyst wall (endocyst) strips out of the adventitious covering. Further, if the limpid fluid contained in the cyst be examined the hooklets are readily found.

Hydatids are occasionally met with in the pelvis in women either in connexion with the genital organs, or with the extraperitoneal tissues. They may be found in the loose connective tissue surrounding the vagina, especially in the postero-lateral position; and as this region is not occupied by congenital cysts a correct supposition as to their nature may sometimes be made. In the uterus hydatid cysts have been known to assume a considerable size and contain many daughter cysts. In the broad ligaments and retropelvic connective tissue these cysts are found more commonly than elsewhere in the pelvis. When the ovary and Fallopian tubes are involved it is probably by direct extension from cysts in the broad ligament.

Treatment.—Hydatid cysts must be removed whenever possible. If the uterus be involved hysterectomy is the best mode of treatment. When situated in the connective tissue around the vagina or in the pelvis the cyst or cysts should be dealt with by incising the overlying structures, and enucleating the endocyst from its adventitious fibrous covering.

CHAPTER XI.

RETENTION AND EFFUSION CYSTS OF THE GENITAL TRACT.

In this chapter those cysts which do not arise as new growths nor by degeneration of existing growths will be considered.

§ i. CYSTS OF THE VULVA.

These may be developmental or acquired.

Developmental cysts occur on the labia minora and arise from Wolffian relics. They are lined with columnar epithelium. (See also Cystic adenoma of the vulva, p. 299.)

Cysts of Bartholin's duct and gland occur at any age after puberty, and are due to the blocking of the duct by an inflammatory process which is the result of a direct infection, or of infection following an injury such as is caused by friction from active exercise or bicycling. As a contributory cause we must give an important place to sexual excitement. It is most common to see the condition on the left side, but as there is no special reason for it this may be only a coincidence.

The **symptoms** are those of inconvenience experienced in walking; and of pain and tenderness should the cyst suppurate, as occasionally happens.

The **diagnosis** is easy. A cystic swelling the size of a pigeon's egg is found distending the lower portion of the labium majus: the labium minus of that side may be stretched at its lower end over the top of the cyst (fig. 200). A careful examination in front of the hymen, at the lower part of the angle formed by this structure and the distended wall of the cyst, may reveal the blocked and bulging orifice of the duct of Bartholin's gland.

The differential diagnosis lies between the condition described, a haematoma of the labium, an abscess of Bartholin's gland, a growth of Bartholin's gland, and an exclusion cyst in the canal of Nuck (hydrocele). The low position in the labium, and the cystic nature of the swelling, with the freedom from pain and tenderness or signs of inflammation —unless this process supervene— are sufficiently characteristic to enable the practitioner to make a diagnosis.

Fig. 200.—Retention cyst of the duct of Bartholin's gland on the left side. The way in which the labium minus is lost on the surface is shown.

The **treatment** consists of excision of the cyst together with the gland (see p. 475).

Sebaceous retention cysts may occur on any part of the labia majora and mons Veneris just as they do on ordinary skin surfaces. The diagnosis is quite easy, for the ordinary characteristics of a sebaceous cyst are seen. The swelling is just under the skin, to which it is adherent around the orifice of the duct; it is elastic and freely movable on the deeper structures. The treatment consists of excising the cyst.

Sebaceous cysts are not often seen in the labia minora, although there are often a number of sebaceous glands present. They do, however, sometimes occur as globular swellings the size of a green pea in the substance of the labium, and can readily be excised.

Lymphatic cysts, due to dilatation of lymphatic spaces, are sometimes seen in the labia minora. Microscopically they are found to have an endothelial lining.

Hydrocele of the canal of Nuck.—The peritoneal process which produces the canal of Nuck, and follows the course of the round ligament on each side to the labium majus, normally becomes obliterated. It may, however, remain patent and a hernia descend into the labium; or it may form a reducible hydrocele: that is to say, with the patient standing a cystic swelling occupies the upper third of the labium majus and disappears when she lies down. Or, an *encysted hydrocele* may be formed by the obliteration of the neck of the sac and the secretion of fluid in the unobliterated cavity below. When this rare

condition obtains a movable cystic swelling is found in the upper part of the labium majus. There is usually a history of the 'lump' having been there from childhood—if, indeed, advice is not sought at that period of life.

Treatment consists of making an incision over the cyst and excising it.

Effusion cysts of the labia majora may occur in the form of haematomata which have already been described (p. 132).

§ ii. CYSTS OF THE VAGINA.

These may be either developmental in origin or acquired. Collections in the vaginal canal, such as haematokolpos, are considered elsewhere (see pp. 124 and 193).

Developmental cysts of the vagina.—These arise from localized dilatations of a persistent Wolffian (Gartner's) duct. It is said that some originate from the Müllerian duct, but it is difficult to understand how this is possible in a patient with a normal vagina and uterus.

The Wolffian duct (fig. 201) running between the two layers of

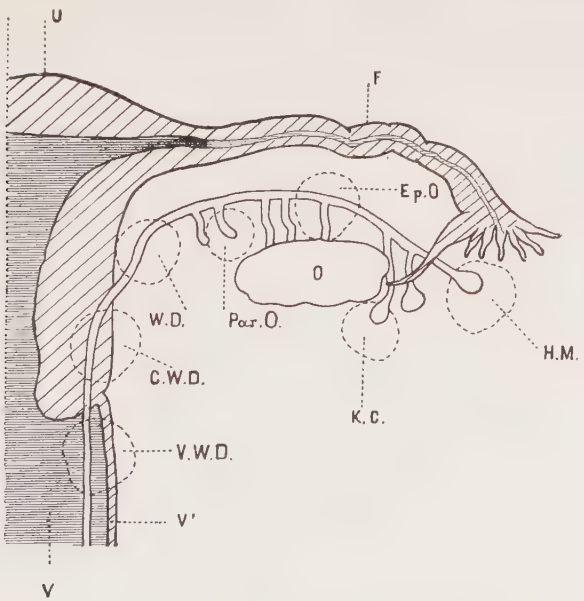


Fig. 201.—Diagram to illustrate the various positions in which retention cysts may arise in connexion with the Wolffian duct and its tubules.

U. Uterus. *F.* Fallopian tube. *V.* Vagina. *V'.* Vaginal wall. *O.* Ovary. *H.M.* Hydatid of Morgagni. *K.C.* Cyst of Kobelt's tubules. *Ep.O.* Cyst of Epoöphoron. *Par.O.* Cyst of Paroöphoron. *W.D.* Cyst of Wolffian duct in the broad ligament. *C.W.D.* Cyst of the Wolffian duct in the cervix. *V.W.D.* Cyst of the Wolffian duct in the vagina.

the broad ligament to the side of the uterus enters the wall of the cervix, where all trace is usually lost. Originally it opened on each side into the urogenital sinus, consequently it extended down along the side of the vagina to the commencement of the lower third, which is usually formed by the urogenital pouch. Cysts of the Wolffian duct may, then, occur in the antero-lateral walls of the vagina and cervix uteri, or in the broad ligament. Sometimes the cyst is continuous or coincidental with another cyst arising from this duct in the broad ligament. These congenital cysts in the vagina are usually of the size of a hen's egg, but occasionally tumours as large as a cocoa nut have been removed.

The **symptoms** are of no importance unless the cyst be of such a large size as to cause inconvenience, when on walking or straining it may project through the vaginal orifice, and have the appearance of a large cystocele.

The **diagnosis** is very easy if the cyst be small; when large, care must be taken not to mistake it for a cystocele, which it much resembles. The passage of a sound into the bladder is, however, sufficient to settle this point. If laterally situated and large the cyst may resemble a haematokolpos in a lateral vagina with a double uterus (cf. fig. 111, p. 126). These cysts usually contain a clear fluid of the consistence of glycerine. Sometimes the fluid is thinner, or it may even be thicker and blood-stained. On microscopical section the interior of the cyst is seen to be lined with low columnar (cubical) epithelium in a single layer (fig. 202).

Treatment.—If the cyst be discovered accidentally, and be causing no symptoms, no treatment is necessary, even when it is large. Such cysts do not necessarily obstruct labour. In one case the woman went through a normal parturition shortly before the cyst, which was nearly as large as the foetal head, was removed.

When they cause inconvenience they may be removed by enucleation, or by excision of part of the adjacent vaginal and cyst walls (see p. 491).

Traumatic cysts occur for the most part on the posterior vaginal wall, and are the commonest variety of acquired cysts in the vagina. They are formed in two ways.

(1) By occlusion of a crypt in the vaginal mucous membrane, or from the laceration of the mucous membrane and inclusion of some part of it in the process of healing (implantation dermoid). These cysts are very thin walled, often translucent, and contain clear, watery fluid. Microscopically they are found to be lined with squamous epithelium. They are best treated by removal with scissors; this is a simple procedure as they generally project well into the lumen of the vagina.

(2) By effusion of blood or serum into the connective tissue of the vaginal wall. These collections may disappear of themselves. If they do not, they should be opened and drained for a day or two, and then allowed to close.

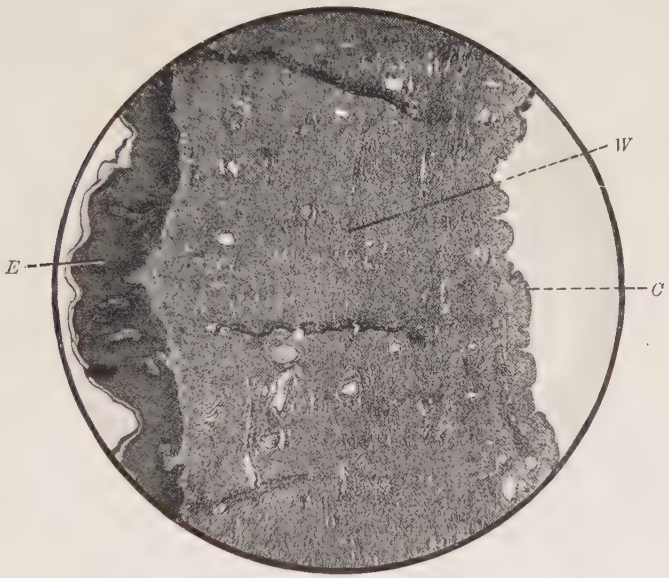


Fig. 202.—Section through the wall of a vaginal cyst, derived from the Wolffian duct, showing the normal vaginal stratified epithelium (*E*), the connective tissue cyst wall and wall of the vagina (*W*) and the columnar epithelium (*C*) lining the cyst. × 50. (*Photomicrograph.*)

Lymphatic cysts.—These are also most commonly situated on the posterior vaginal wall, and are formed as the result of dilatation of lymphatic spaces. These cysts are lined with endothelial cells. The treatment of them is by excision, or by incision and drainage.

Cysts in connexion with urethral glands.—These occur low down in the anterior wall of the vagina, and arise as dilatations of Skene's tubules, which are the ducts of Max Schüller's urethral glands, situated between the urethra and the lower part of the anterior vaginal wall. The orifices of the ducts become occluded as the result of mild inflammatory processes in the urethra.

Retention cysts of the vaginal glands.—Some authorities deny the existence of vaginal glands. They are undoubtedly few and far between, but that they are occasionally to be found is certain; and retention cysts lined with cubical epithelium arising from these structures are sometimes met with.

§ iii. CYSTS OF THE UTERUS.

Retention and effusion cysts occurring in the uterus may be classified in the following manner:

(1) Mucous or follicular cysts.
(2) Serous cysts.
(3) Blood cysts.
(4) Embryonic cysts.

Retained secretions, giving rise to haematometra, are considered elsewhere (see pp. 124 and 193).

Mucous or follicular cysts occur chiefly in the cervix, and are due to blocking of the cervical gland ducts, with consequent retention of the secretion and dilatation of the gland. They may also occur in the uterine cavity, but are probably rare in this situation, unless associated with fibromyomata. When they occur in the cervix the result may be either merely the production of the small, bluish cysts which bulge on the vaginal surface of the cervix and are known as *ovula Nabothii* (fig. 173, Plate III.), in which the secretion is sometimes inspissated; or there may be considerable cystic enlargement due to blockage of the ducts of some of the large glands. A specimen from such a case is shown in figure 203.

Fig. 203.—Retention cysts in the cervix uteri. (*M. H. Phillips.*)

Symptoms may be absent, or there may be leucorrhoea and the other evidence of chronic cervicitis, a condition which predisposes to the formation of these retention cysts.

Treatment.— This must be directed towards the cure of the cervicitis, amputation of the cervix being indicated in bad cases.

Serous cysts may be considered pathologically identical with the lymphatic cysts already discussed in connexion with the vagina. They are formed by the dilatation of lymphatic spaces and are very rare.

Blood cysts are due to effusion of blood—the result of injury or disease.

Embryonic cysts are considered to have origin in defects in the normal course of development of the Müllerian and Wolffian ducts, or of the Wolffian body. They are said to occur most commonly at the cornua, fundus, and in the lateral walls of the uterus. They have

a lining of columnar epithelium, and sometimes contain papillomata, in which case they are really growths and not retention cysts.

The **symptoms** of cysts of the body of the uterus are somewhat indefinite and by no means pathognomonic. Menorrhagia is sometimes a prominent symptom.

Treatment.—Serous and blood cysts may be incised and drained after hysterotomy has been performed (see p. 502). In most of the other cases hysterectomy is necessary.

§ iv. CYSTS OF THE BROAD LIGAMENT.

Broad ligament cysts are due to the collection of secretion in the tubules in connection with Gartner's (Wolffian) duct, which runs from the fimbriated extremity of the Fallopian tube, forms the base of the parovarium and then passes on down the side of the uterus to the cervix (fig. 201). Or more rarely broad ligament cysts may be due to dilatation of the duct itself.

Cysts of Gartner's (Wolffian) duct.—A single large cyst, or a string of cysts, may be formed in any part of the course of the duct of Gartner.

If the cyst be single, and occur in the main and lower part of the duct, it may be found distending the space between the layers of the broad ligament, and perhaps raising and pushing the uterus over to the opposite side. These cysts, which are somewhat rare, are lined with columnar epithelium. They should be removed if causing symptoms.

Cysts of the parovarium are very common in young women; they may be quite small (fig. 204), or they may attain to a considerable size, filling the abdomen. The fluid contained in them resembles that found in cysts arising from Gartner's duct, from which they cannot always, when large, be differentiated clinically; it is of a very low specific gravity (about 1002), and contains little or no albumin. So that if such a cyst be tapped, under the belief that the patient is suffering from tuberculous peritonitis or ascites from another cause, the examination of the fluid should lead to a correct diagnosis being made.

In structure these cysts consist of a peritoneal coat, and a thin fibrous cyst wall lined by columnar epithelium (fig. 205), which in large tumours becomes flattened or is shed.

The **diagnosis** of these tumours presents no great difficulty beyond the fact that it is sometimes not easy to differentiate between them

Fig. 204.—Small parovarian cyst. This specimen shows well the relations of a parovarian cyst to the tube, which is stretched over the surface, and to the ovary. It is situated between the hilum of the latter and the tube.

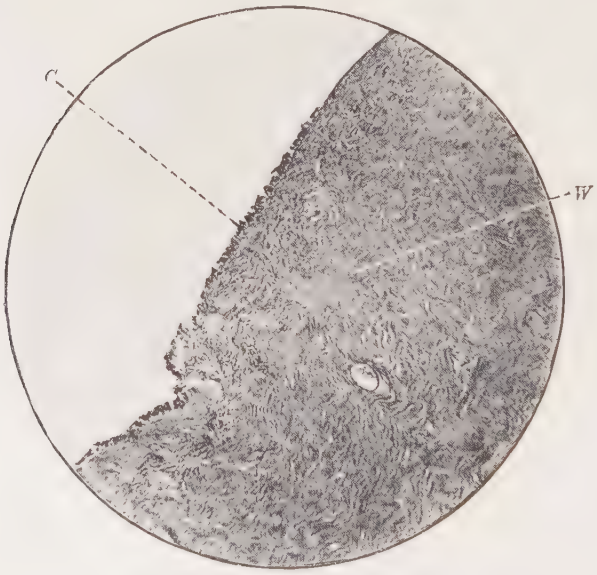


Fig. 205.—Section through the wall of a parovarian retention cyst. The remains of the columnar epithelium lining can be seen (*C*) and also the fibrous nature of the cyst wall (*W*). ×100. (*Photomicrograph.*)

and ovarian cysts. The light fluid contents, the thin cyst walls, and their unilocular character, all of which can often be made out on physical examination, may give one an indication of their nature.

Treatment.—This consists of removal. When the abdomen is opened the peritoneum is seen to be stretched over the cyst, on the surface of which it is freely movable; the Fallopian tube and the round ligament are also closely applied to the surface and are often much elongated when the tumour is large. In the removal of cysts arising from the lower part of the Wolffian duct, the peritoneum must be opened and the cyst shelled out, for the pedicle is either absent or frequently very broad.

Parovarian cysts, however, usually have a pedicle, but this is sometimes broad, in which case the tumour should be shelled out after an incision has been made through the peritoneum, which thereupon quickly retracts leaving a very small aperture to be sutured.

Cysts of Kobelt's tubules.—Small and quite unimportant cysts of these tubules from the duct of Gartner on the outer side of the parovarium are sometimes seen (fig. 206). They present on the front aspect of the broad ligament.

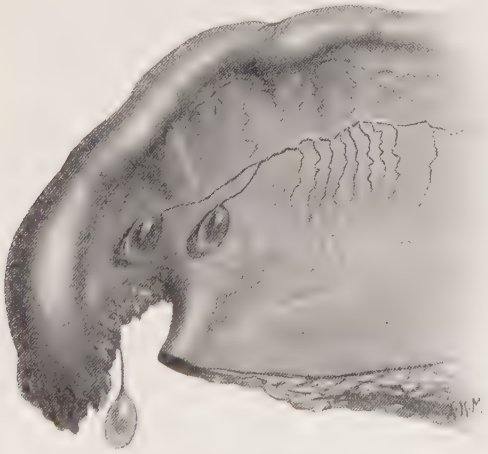


Fig. 206.—Anterior aspect of the broad ligament and outer end of the Fallopian tube. Two cysts of Kobelt's tubules are shown at the outer end of the parovarium, and a hydatid of Morgagni is seen hanging from the fimbriated extremity of the tube.

The 'hydatid' of Morgagni can hardly be classified with broad ligament cysts. These small and unimportant cysts, which are seen depending from the fimbriated extremity of the Fallopian tube, originate in a dilatation of the extremity of the Wolffian duct. They give rise to no symptoms, and require no treatment.

Cysts of the paroöphoron.—Retention cysts of the paroöphoron

(fig. 201) are very uncommon and cannot be distinguished clinically from cysts of Gartner's duct.

Cysts in accessory Fallopian tubes.—An occluded accessory tube may become distended with fluid secreted in its interior, after the manner of a hydrosalpinx. This condition is very rare.

Serous cysts of the peritoneum.—Large collections of serous fluid forming peritoneal cysts are frequently found in the pelvis in connexion with disease of the pelvic organs. They are always due to oedema of the neighbouring tissues, the result of inflammation or pressure on the veins and lymphatics. They are only discovered on the operation table.

§ v. CYSTS OF THE OVARY.

Distension of the Graafian follicle is the only retention cyst met with in the ovary. This condition is known as *hydrops folliculi*. The cyst rarely reaches a size larger than that of a walnut, and the condition is of no clinical importance. Sometimes there are

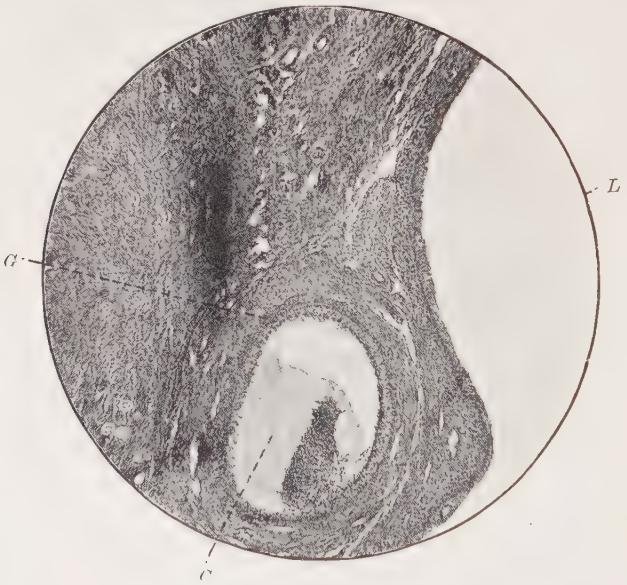


Fig. 207.—Follicular cyst of the ovary. The section shows the wall of a large follicular cyst lined with the remains of membrana granulosa cells (*L*). In the lower part of the figure a small follicular cyst is seen (*C*) also lined with the membrana granulosa (*G*). ×100. (*Photomicrograph.*)

several of these cysts in the same ovary. Microscopically the cyst is seen to be lined with the cells of the membrana granulosa which is supported by the thecae interna and externa (fig. 207).

§ vi. TUBO-OVARIAN CYSTS.

These cysts have been classified in the following manner:

(1) Pseudo-tubo-ovarian cysts.
(2) Inflammatory tubo-ovarian cysts.
(3) Teratological ovarian hydroceles.

Pseudo-tubo-ovarian cysts are quite common, and are in reality nothing more than a hydrosalpinx of the distal end of the tube, which has become sealed and adherent to the ovary as the result of some inflammatory process. The proximal end of the tube is normal in size, while the fimbriated end may be expanded to the size of a hen's egg. On examining the interior of one of these cysts (fig. 208) one sees the

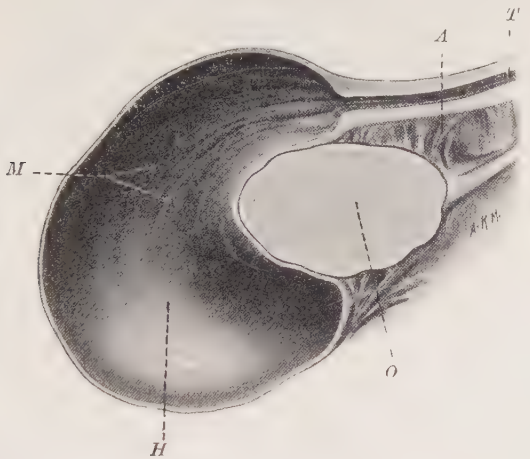


Fig. 208.—Semidiagrammatic representation of a pseudo-tubo-ovarian cyst.

A. Adhesions. *T*. Undilated portion of Fallopian tube. *M*. Thinned out folds of the lining membrane which are gradually lost in the more dilated part of the hydrosalpinx (*H*.) *O*. Ovary around which the hydrosalpinx is folded.

plicae of the mucous membrane of the Fallopian tube, where the latter apparently opens into the cyst (dilated portion of the tube), spreading out from the orifice of the undilated portion like the ribs of an umbrella. A careful examination, however, will reveal the fact that these are not fimbriae, as may be thought, but are the ordinary *plicae* of the mucous membrane, which may be traced over the wall of the pseudo-cyst until (in the distended portion) they become too flattened out by pressure to be recognizable. There is no communication between the cystic tube and the interior of the ovary.

Inflammatory tubo-ovarian cysts are, like the pseudo-tubo-ovarian cysts, fairly common. In this case the same state of affairs

obtains in regard to the tube, which is distended, in the manner already described above under the pseudo-cystic condition. There is, however, in addition, a communication between the dilated end of the tube and a cystic cavity in the ovary (fig. 209). The cystic degeneration of the ovary is probably due to the inflammatory processes which produced the hydrosalpinx. It is thought that the ovary first becomes adherent to the closed end of the tube, or itself closes the fimbriated orifice, and that the cystic cavity or cavities in the ovary burst into the tube. We frequently come across an ovarian abscess communicating

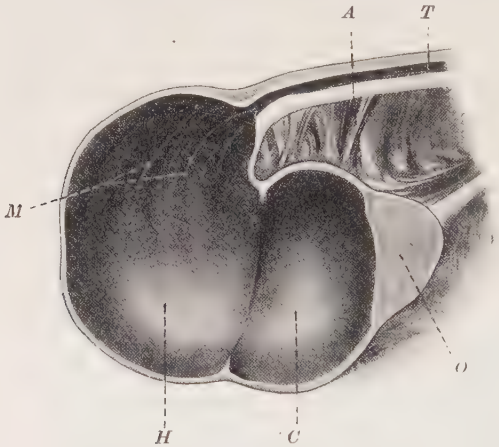


Fig. 209.—Semidiagrammatic representation of an inflammatory tubo-ovarian cyst.

A. Adhesions. *T*. Undilated portion of Fallopian tube. *M*. Thinned out folds of the lining membrane which gradually become lost in the more dilated portion of the hydrosalpinx (*H*). *C*. Ovarian cyst connected with the hydrosalpinx. *O*. Ovary.

with a pyosalpinx, so that it is easy to imagine that the inflammatory tubo-ovarian cyst is of the same nature, but the result of a milder infection.

Teratological ovarian hydroceles are at once the most interesting and rarest of tubo-ovarian cysts. In them there is an atavistic tendency; for, as we have already seen, in some of the lower animals the ovarian hydrocele is the normal condition.

In these cases the tube, whose extremity may be somewhat dilated, opens into a peritoneal sac on the posterior surface of the broad ligament. The ovary may be discovered spread out over the wall of this sac or imbedded in it (fig. 210). In some cases no ovarian tissue has been found. The hydrocele sometimes contains papillomata and grows to a considerable size.

The **symptoms** of tubo-ovarian cysts are usually those of inflammatory disease of the appendages. That is to say the patient

complains of dysmenorrhoea, dyspareunia, backache and abdominal pain. In the case of ovarian hydrocele there may be superadded the pressure symptoms of a large cyst; but if it be small no symptoms are produced at all. Bimanually one can detect the cystic enlargements on one or both sides of the pelvis. An absolute diagnosis is practically impossible. All one can do is to make a diagnosis of inflammatory disease of the appendages, or of ovarian cyst.

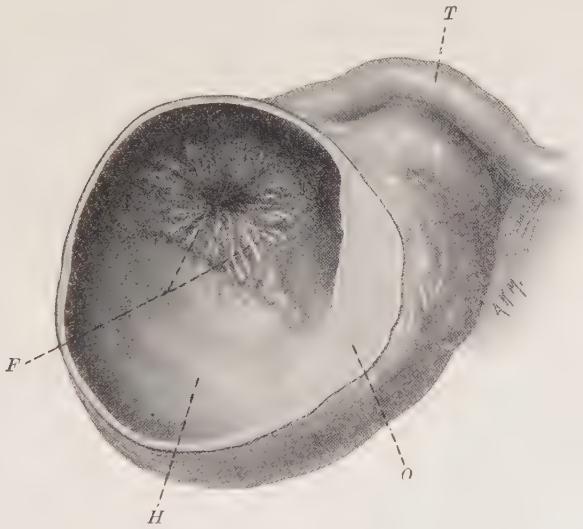


Fig. 210.—Semidiagrammatic illustration of a teratological ovarian hydrocele.

T. Fallopian tube. *F*. Fimbriated extremity opening into the hydrocele sac (*H*). *O*. Ovary imbedded in the wall of the hydrocele.

The **treatment** consists of the removal of the tube and ovary of one or both sides as the case may be. Sometimes an attempt may be made to save the normal part of the tube and ovary, by excising only the cystic portion. In cases of ovarian hydrocele in which there are papillomata it is safer to remove the whole tube and ovary, and great care must be exercised lest any of the intracystic growths escape and become implanted in the peritoneal cavity.

CHAPTER XII.

INNOCENT NEOPLASMS OF THE GENITAL TRACT.

§ i. INNOCENT GROWTHS OF THE VULVA.

The innocent growths which may be found on the vulva consist of the following varieties: lipoma, fibroma, papilloma, adenoma, neuroma and angioma.

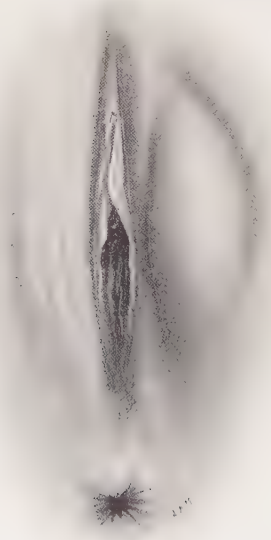


Fig. 211.—Lipoma of the left labium majus.

LIPOMATA (fatty tumours) are fairly common and occur chiefly in the labia majora. They are also found in connexion with the round ligament and on the mons Veneris. They may grow to an enormous size, but advice is usually sought early. Figure 211 is an illustration of a small lipoma of the left labium majus.

The **symptoms** are only those of the inconvenience caused by the size of the growth.

The **treatment** consists of making an incision through the skin over the tumour and enucleating it.

FIBROMATA are usually attached by a pedicle from which the tumour hangs suspended (fig. 212). These growths frequently become oedematous, and may slough.

The **symptoms** complained of are those due to the size and weight of the growth, which may cause inconvenience in walking.

Treatment.—When the tumour is pedunculated removal is carried out by means of an oval incision round the base of the pedicle.

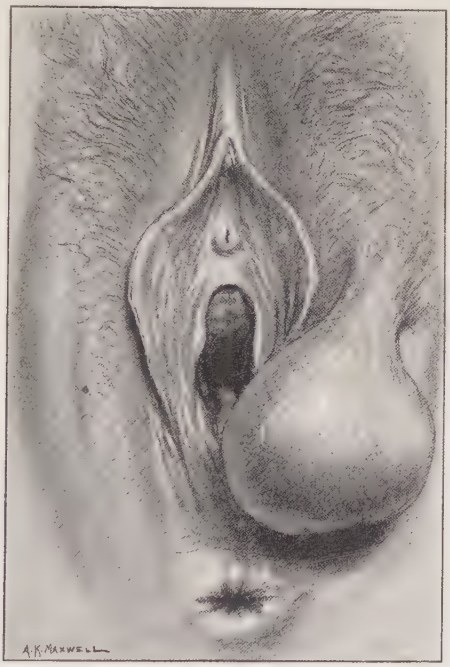


Fig. 212.—Pedunculated fibroma hanging from the left labium majus.

PAPILLOMATA are of two varieties: those occurring on the skin surfaces (warts), and those arising in the neighbourhood of the urethral orifice (caruncles).

Warts may occur on the labia majora or mons Veneris, just as they do on the skin of any other part of the body. The ordinary papillomata must not be confounded with gonorrhoeal warts, nor with the condylomata of secondary syphilis. It is extremely doubtful if they become malignant. Simple discrete papillomata give rise to no symptoms and require no treatment. At a patient's request they may be excised.

Caruncles occur most frequently in women about or after the menopause. They usually originate from the mucous membrane at the orifice of the urethra. When seen *in situ* these growths are generally bright red in colour; sometimes, however, they are of a deep red shade, and they either hang out of the urethral orifice (fig. 173, Plate III.), or

are attached to its margin. They vary in size; some are the size of a hazel nut, while others merely form a red spot. They are sometimes (not always, as usually stated) very sensitive, and may give rise to dyspareunia and pain or smarting on micturition.

Formerly these growths, owing to their macroscopical appearance, were classified as angiomata, for they are often very vascular. Several attempts have been made of recent years to investigate the pathology of these common neoplasms. Some observers classify them as adenomata and granulomata. It seems better, however, to classify them as papillomata, and when glands are present to look upon the growth as a mucous polyp. The granulomatous appearance should be regarded as a secondary process, the result of infection.

Figure 213 is an illustration of a section of an ordinary urethral caruncle. It is covered with squamous epithelium, and has a very

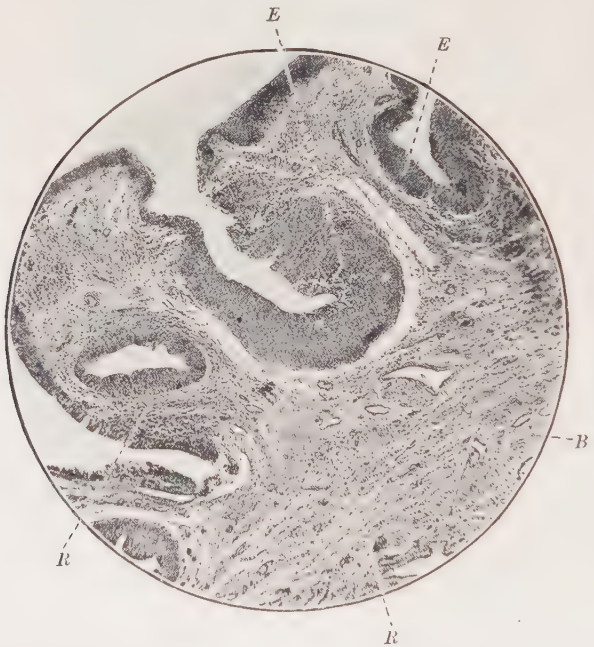


Fig. 213.—Urethral caruncle. The section shows this to be a pure papilloma from the lower end of the urethra. It is covered with stratified epithelium (*E*) which is everywhere invaded by small round cells (*R*). The stroma which is also infiltrated with small round cells is very vascular and contains largely dilated blood vessels (*B*). ×100. (*Photomicrograph.*)

vascular connective tissue stroma. Further it will be noted that there is a large number of leucocytes, showing that it is infected. It is, in fact, an infected papilloma, and contains no adenomatous tissue.

The **treatment** of these growths consists of their complete excision (see p. 478). After cauterization they are said to recur, but as a matter of fact the supposed recurrence is merely granulation tissue, forming what has been called the 'granulomatous caruncle.'

ADENOMATA.—These are very rare; in two cases the growth occurred on the fourchette and on the inner surface of the labia majora as small papillomatous cystic swellings about the size of a bean. Figure 214 represents a section of one of these tumours. It

Fig. 214.—Papillary cyst of the vulva. On the right is a low (×20) and on the left a high power view (×150). (*Photomicrograph.*)

W. Cyst wall. *P.* Papillary outgrowths. *S.* Stroma of papilla. *E.* Columnar epithelium covering the papilla.

is doubtful from what structures they can have originated; possibly they arise from embryonic relics.

Simple adenomata of Bartholin's glands are stated to occur, but it is certainly more common for these growths to be adenocarcinomatous in nature.

NEUROMATA.—These growths have been described by Simpson as occurring in the neighbourhood of the urethra, and were said to resemble 'urethral caruncles.' There is, however, no evidence in his description to show that they were true neuromata.

ANGIOMATA may also occur, but are probably very rare. As already mentioned urethral caruncles, previously thought to be angiomata, are certainly not usually so.

§ ii. INNOCENT GROWTHS OF THE VAGINA.

These are very uncommon, the only varieties that have been recorded being fibromata, fibromyomata, and very rarely adeno-fibromyomata.

FIBROMATA, FIBROMYOMATA AND ADENOFIBROMYOMATA, occur as single tumours, and may be sessile or pedunculated, and usually grow from the anterior wall of the vagina.

Symptoms.—These only occur when the tumour is of large size. There may be difficulty in the act of micturition, with increased frequency from pressure on the bladder and urethra, or from the tumour dragging on the base of the bladder. This is especially the case if the tumour be extruded from the vagina.

If the growth undergo degeneration or become infected there may be a foul vaginal discharge, and constitutional disturbances may arise from septic absorption. This is most liable to happen when the tumour is pedunculated.

These growths may cause obstruction to the passage of the foetus during labour.

The **diagnosis** is usually a simple matter. It is necessary to be sure that the tumour does not spring from the cervix uteri, and that it is not extruded through the external os. It may sometimes be impossible to determine the site of origin of large growths until the main portion has been removed.

The **treatment** consists of enucleating the growth when sessile, or cutting through the pedicle when pedunculated. Any bleeding vessels should be caught and tied. When the growth is very large and cannot be delivered through the vaginal orifice, it should be removed piecemeal.

§ iii. INNOCENT GROWTHS OF THE UTERUS.

These are either simple adenomatous or fibromyomatous growths, or a combination of the two varieties.

ADENOMATA of the uterus assume various clinical forms.

PLATE VI.

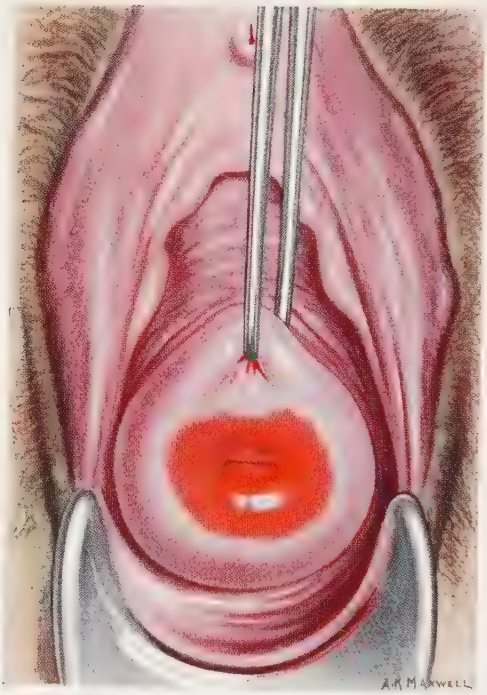


Fig. 215. 'Erosion' of the cervix.

[*To face p. 301.*

'Erosion' of the cervix.—A very common form of adenoma is that seen on the cervix and known as 'erosion'. It may occur in nulliparæ, but is more usual in multiparæ; it is generally found between the ages of twenty-five and forty years. On vaginal examination a 'raw' patch can be seen on the cervix spreading outwards from the cervical canal: this has the appearance of a superficial ulcer (Fig. 215, Plate VI.). It will be noted that, if untouched, the surface is shiny, but that, when touched, bleeding is easily produced from the delicate surface, which is covered with a single layer of columnar epithelium.

'Erosion' occurs with or without laceration of the cervix: and is an *extension* outwards of the adenomatous lining of the cervical canal.

Fig. 216.—'Erosion' of the cervix. *A*, Adenomatous tissue. *B*, Papillary growths covered with columnar epithelium. It is these that cause the sensation of heat. ×75. (*Bland-Sutton.*)

Diagnosis.—When associated with the condition of 'erosion' [illegible] is like velvet [illegible] the papillæ [illegible] by this [illegible] the condition [illegible] diagnosed [illegible] the use of direct inspection. [illegible] must be [illegible] from ectropion of the mucous membrane [illegible] to [illegible], and cervicitis due to [illegible] operations [illegible] can also be distinguished from [illegible] ulcerations [illegible] from malignant ulcers. The history

PLATE VI.

Fig. 215. 'Erosion' of the cervix.

[To face p. 301.

'Erosion' of the cervix.—A very common form of adenoma is that seen on the cervix and known as 'erosion.' It may occur in nulliparae but is most usual in multiparae, and is generally found between the ages of twenty-five and fifty years. On vaginal examination a bright red patch can be seen on the cervix, spreading outwards from the central canal; this has all the appearances of a superficial abrasion (fig. 215, Plate VI.). It will be noted that, if untouched, the surface is shiny, but that when rubbed, bleeding is easily produced from the delicate surface, which is covered with a single layer of columnar epithelium.

'Erosion' occurs with or without laceration of the cervix; and is an *extension* or growth outwards of the adenomatous lining of the cervical canal.

Fig. 216.—'Erosion' of the cervix. *G.* Adenomatous tissue. *P.* Papillary growths on the surface, covered with columnar epithelium; it is these that impart the velvety sensation to the examining finger. ×75. (*Photomicrograph.*)

Diagnosis.—When examined with the finger an 'erosion' usually feels like velvet owing to the papillary surface, and by this peculiarity the condition can be diagnosed even without the aid of direct inspection. 'Erosion' must be distinguished from extrusion of the mucous membrane due to cervical infection (see p. 246), and eversion due to cervical lacerations (see p. 139). It must also be distinguished from infective ulcerations, and from malignant ulcers. The velvety

sensation imparted to the finger is quite typical of this condition. Malignant ulcers have a hard raised edge which is nearly always everted. Infective ulcers, whether syphilitic, tuberculous, or simple, have well defined margins and an infiltrated surface which can easily be felt by the examining finger. On inspection, too, all true ulcerations show a greyish, sloughy surface and well defined edges, whether they be raised or punched out. Any possible doubt can be cleared up by a microscopical examination, when the simple glandular character of the 'erosion' is demonstrated (fig. 216).

Symptoms may be absent, or the patient may complain of leucorrhoea.

Treatment consists in the removal of the affected surface by scraping or excision. If there be lacerations of the cervix these must also be repaired, or the cervix amputated.

Adenomatous polypi generally arise from the cervix, but it is not unusual to find them originating in the uterine cavity, especially from just inside the internal os. They are, in fact, stalked adenomata, and may have all the structural characteristics of the adenomatous endometrium from which they originate. As a rule the stroma is soft and contains many glands (fig. 217). Not infrequently myxomatous tissue is present in soft polyps. Clinically, the soft polyps are usually found hanging outside the cervix as tongue-like processes which vary from a mere tag to the size of a sardine, the body of which they resemble in shape. These growths may be bright scarlet in colour or of a dull, almost purple hue; the latter is produced by partial strangulation of the pedicle. Several polyps may occur in the same uterus; but usually, if large, they are single.

Sometimes cervical polyps are adenofibromyomatous in structure (fig. 218). These hard polyps are generally round in shape, and arise from the interior of the cervical canal.

Symptoms.—The only prominent symptom is menorrhagia and intermenstrual haemorrhage; although on rare occasions expulsive contractions may give rise to pain.

The **treatment** consists of removal, either by cutting through the pedicle with scissors, or, when the growth is attached high up in the uterus, by twisting it off while held in a pair of forceps. As a rule no bleeding follows these procedures.

Diffuse adenoma of the endometrium.—This disease has long been described under the name of 'endometritis,' owing to an entirely erroneous conception of the etiological and pathological conditions associated with it. The term 'endometritis' denotes an inflammatory change in the endometrium, and must not be applied to the alteration from the normal to be described here.

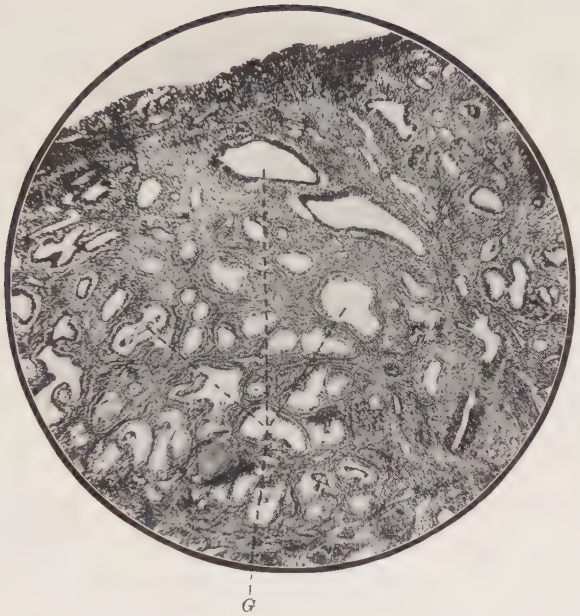


Fig. 217.—Soft adenomatous uterine polyp. A large number of glands (*G*) are seen imbedded in a loose and vascular connective tissue stroma. ×75. (*Photomicrograph.*)

Fig. 218.—Adenofibromyomatous polyp of the cervix. ×75. (*Photomicrograph.*)

S. Dense fibrous stroma. *G.* Dilated glands.

Diffuse adenomatous changes occurring in the cervical mucosa and endometrium have been classified in various ways; but there are really only two varieties, and the difference between these is probably merely a question of degree, and to some extent dependent upon local conditions, such as the density of the stroma. In studying sections of the endometrium it must always be borne in mind that the condition of that structure varies considerably in relation with the function of menstruation, and that the observer must be well acquainted with the normal physiological changes before he is in a position to say what is pathological.

(1) Glandular hyperplasia.—In this condition, which may be found in women of any age, the number of the glands is increased, and intraglandular papillary tufts, due to invagination of the gland wall, are often seen. A section of such an endometrium is shown in figure 219, which may be compared with figure 45 B (p. 48), illustrating the normal endometrium.

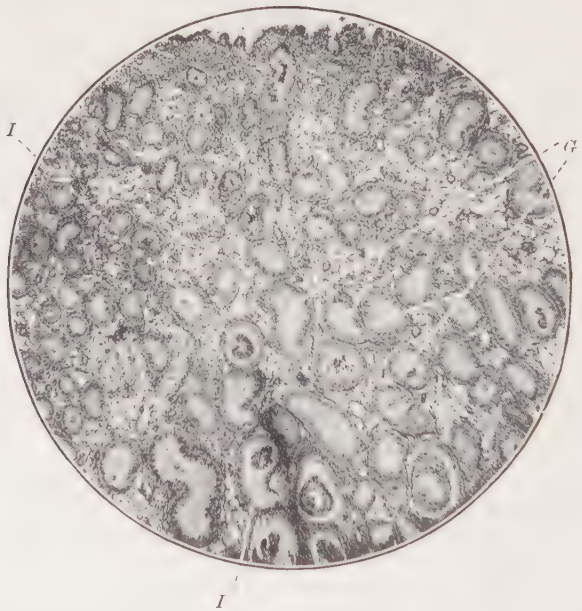


Fig. 219.—Glandular hyperplasia of the endometrium. The whole endometrium is seen to be closely packed with glands (*G*). There is very little loose interglandular stroma. In some of the glands there are 'intraglandular tufts' (*I*) due to invaginations of the gland walls. × 75. (*Photomicrograph.*)

There is no doubt that too much has been made of the lesser degrees of glandular hyperplasia (the commonest variety of the so-called 'endometritis') which often can hardly be considered pathological, for

the structure of the endometrium in any two women is never quite the same; and there are probably no symptoms attaching to the majority of cases of this kind. In the more extreme cases, however, such as that from which the above section was taken, the condition may pass on into the so-called 'fungous' adenoma of the endometrium, in which the extensive glandular hyperplasia leads to the lining membrane of the uterus becoming rough with small villous projections. Indeed, in some cases adenomatous polyps are formed. Such cases are always associated with menorrhagia, and should be treated by curettement.

(2) Glandular hypertrophy may occasionally be seen in young women, but it occurs generally in women who have borne children and are between the ages of thirty-five and fifty years. It is usually confined to the body of the uterus, but a similar condition may be found in relation to the cervical mucosa. This change in the endometrium is also frequently found in association with fibrosis, and with fibromyomata of the uterus. There is a general thickening of the endometrium, and in some cases there are scattered projections due to dilated glands. There is a very marked increase in the size of the glands, some of which may be distended with secretion. Figure 220

Fig. 220.—Glandular hypertrophy of the endometrium. The glands (*G*) are enlarged, distended and distorted. ×75. (*Photomicrograph.*)

represents the microscopical appearances of the endometrium with glandular hypertrophy. It is important not to confuse this disease

clinically with an oedematous condition of the endometrium, such as is found in cases of retroversion and prolapse of the uterus.

In the latter case the microscopical appearances show that the endometrial elements are normal, but that they are lying in an oedematous stroma (fig. 126, p. 156).

The **symptoms** associated with glandular hypertrophy are menorrhagia and leucorrhoea; should the condition be associated with polypi there may be metrostaxis.

The **treatment** consists of curettement. One operation is rarely sufficient to effect a cure. When the disease is associated with fibrosis or fibromyomata uteri the treatment in the majority of cases will be directed towards the major lesion, and hysterectomy will be performed.

FIBROMYOMATA UTERI (so-called 'fibroids').—Fibromyomatous tumours of the uterus have of late years attracted much attention. Formerly women were condemned to endure, as best they could, tumours which were somewhat vaguely described as 'innocent.' Innocent they may be in so far as we divide tumours into 'innocent' and 'malignant' according to their histological structure and mode of growth; but 'innocent' they certainly are not in their general effect upon the patient. There are still those who assert that these tumours do not kill; yet there are many women who die from the indirect consequences of such growths after many years of suffering and inability to do more than exist.

With the brilliant surgical advances that took place in the last decade of the nineteenth century a cause of reproach to gynaecological surgery has been swept away; and one of the most notable acquisitions to this science is the knowledge and skill that has made the surgical treatment of fibromyomatous tumours possible. We shall have to devote considerable space to the consideration of these growths, so largely do they figure in the practical experience of all medical men.

Etiology and **pathology.**—Various theories have been put forward as to the etiology and mode of origin of these tumours, but so far the matter has not been satisfactorily determined. It is usually supposed they arise from the walls of the blood vessels.

Fibromyomata are extremely rare in women under the age of twenty years. Activation of the genital organs, with menstruation, appears to be a *sine qua non* for their production. They are most usually seen in women between thirty and forty years of age, during which period of life they are found in a large percentage of all patients examined.

Fibromyomata of the uterus may arise from any part of that organ; they are said to be most common in the posterior wall. As a

rule they arise in the muscular fibres of the body, and become encapsuled by the compressed tissues with which they are surrounded. As they increase in size they sometimes make their way inwards, towards the cavity, when the endometrium stretched over the growth may become atrophied from pressure; so, too, by direct pressure the endometrium on the opposite wall of the cavity is frequently caused to atrophy. At other times the growth makes its way outwards to the peritoneal surface of the uterus and eventually becomes pedunculated.

Thus it is that we have fibromyomata of the body of the uterus classified, according to their position, into growths that are *submucous*, sessile or pedunculated; *intramural;* and *subserous*, sessile or pedunculated. There are also growths which are called *cervical*, from their place of origin. Cervical tumours are of two kinds, supravaginal and vaginal; the former project outwards into the broad ligament, or into the space between the bladder and cervix, or grow from the posterior cervical wall into Douglas' pouch; or, growing inwards the tumour may project into the cervical canal and form a polyp which may protrude from the external os. Again cervical fibromyomata may grow from the vaginal cervix and project into the vagina.

A diagrammatic representation of the commonest of these variations in the position of uterine fibromyomata is given in figure 221.

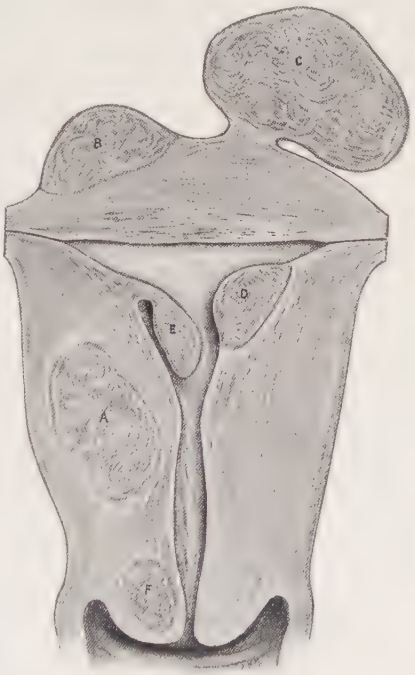


Fig. 221.—Diagrammatic representation of a uterus with fibromyomata in the commonest positions in which they are found.

A. Intramural. *B*. Sessile subserous. *C*. Pedunculated subserous. *D*. Sessile submucous. *E*. Pedunculated submucous. *F*. Cervical.

The naked-eye appearances of fibromyomatous uteri vary enormously. There may be only one or two nodules in the uterine wall, or the whole uterus may be distorted into an indescribable mass by large and small growths, pedunculated or sessile, in every conceivable position. On section a typical fibromyoma presents to the naked eye a peculiar whorled appearance—many whorls existing in each growth. They present, in fact, the appearance of a section of much knotted wood (figs. 221 and 223). Each whorl is separated

by dense connective tissue trabeculae containing blood vessels. Sometimes, however, there is only a single concentric arrangement of the fibres.

Microscopically (fig. 222 A and B) these tumours show muscle cells arranged in interlacing bundles in conjunction with fibrous tissue in varying proportions; some contain a preponderance of muscle elements, others of fibrous tissue. The varying proportions of muscle fibres and fibrous tissue can be demonstrated in a section stained by van Gieson's method whereby the fibrous tissue is coloured pink.

It will be seen that the structure of fibromyomata is more compact than that of the normal muscle wall of the uterus, and that the tumour cells are thinner than the uterine muscle cells, the nuclei being rod-shaped. So, too, the cells and their nuclei in a fibromyoma are much thinner than the oat-shaped cells and nuclei in a spindle cell sarcoma (see fig. 271, p. 381).

Many of these tumours are only 'fibromyomata' in that they develop from myomata into such. Subsequent changes may convert them into fibromata or, as we shall see later, into calcareous masses; so also degenerations such as oedema and necrobiosis may modify their structure, and cause them to soften.

These growths have, therefore, been divided into *hard* and *soft* tumours, according to their degree of vascularity and the proportion of muscular and fibrous tissues; but it must not be forgotten that the ultimate changes and degenerations to which they are peculiarly liable must also be taken into account in estimating the value of this physical sign.

Fibromyomata receive their blood supply from the vessels in the capsule surrounding them. Branches from the arteries dip into the growth, following the course of the connective tissue trabeculae which permeate the tumour. The venous blood, collected both in veins and blood spaces, is returned to the larger trunks in the capsule.

Symptoms.—The patient's symptoms naturally vary very considerably. With a small intramural or subperitoneal growth symptoms may be entirely absent; but with a quite small submucous growth they may be very severe.

The majority of patients are led to seek advice because they suffer from uterine haemorrhage caused by growths that are encroaching on the uterine cavity, or actually forming polypoid tumours in the interior; or from the mechanical symptoms produced by growths of large size or peculiar position. It will, therefore, be convenient to consider the principal symptoms of fibromyomata according to the situation of the growth, if for the present we limit ourselves to the consideration of those tumours in connexion with

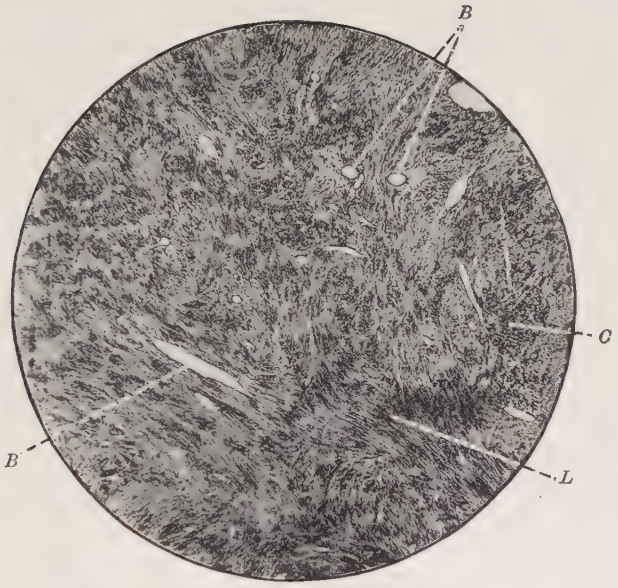


Fig. 222 A.—Section of fibromyoma of the uterus. For the most part the darker shading represents muscle fibres seen running in a longitudinal direction at (*L*) and cut in cross section at (*C*). The lighter shading consists of fibrous and connective tissue. *B*. Blood vessels. ×75. (*Photomicrograph.*)

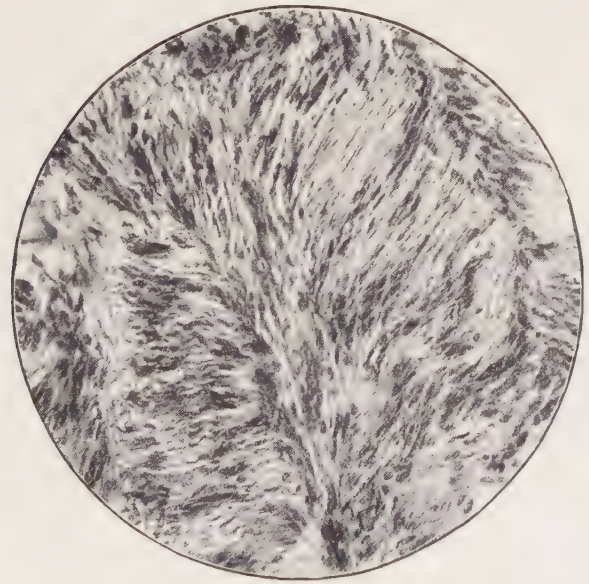


Fig. 222 B.—Fibromyoma of the uterus. The darker shading represents the interlacing muscle fibres, and the lighter shading the fibrous and connective tissue. ×300. (*Photomicrograph.*)

which no complication has arisen. Complicated conditions will be considered separately later.

Taking, then, *submucous* fibromyomata first, we find that haemorrhage is the predominant symptom, either in the form of menorrhagia or menorrhagia with too frequent menstruation, and intermenstrual bleeding. This loss of blood may lead to such severe secondary anaemia that the haemoglobin content of the patient's blood may fall to 30 per cent. of the normal: needless to say this produces a very serious state of ill-health. So, when advice is sought by a patient between the ages of thirty and forty years for severe bleeding of long standing, we should immediately suspect the presence of a fibromyoma or of fibromyomata.

There are two ways in which these growths produce haemorrhage. Firstly, by acting as foreign bodies inside the uterine cavity they stimulate uterine contractions the object of which is to expel the growth. In this the uterus is sometimes entirely successful, and the fibromyoma may be completely detached and expelled by way of the vagina (spontaneous expulsion). Oftener, however, the growth is gradually forced from its submucous position until it forms a polyp, which may be driven through the cervix and caused to project into the vagina, there to slough, owing to the constriction of the pedicle by the cervix and the subsequent infection of the oedematous projecting mass.

Secondly, haemorrhage is produced by reason of the adenomatous condition of the endometrium almost invariably associated with uterine fibromyomata, except, of course, where the mucous membrane is directly pressed upon by a tumour and caused to atrophy. It is, in fact, very common to see long tags of the altered endometrium projecting into the cavity of the diseased uterus.

Another prominent symptom invariably associated with submucous and polypoid fibromyomata is marked menstrual pain (dysmenorrhoea) due to the irregular contractions brought about by the growths acting as foreign bodies in the wall or cavity of the uterus. When the growth forms a polyp the pain may not only be menstrual but intermenstrual, owing to the uterine colic produced by the efforts of the muscular walls to expel the tumour from the cavity.

When the tumour is *intramural* the symptoms depend for their severity on the nearness of the growth to the endometrium. The nearer it is the more severe the dysmenorrhoea and menorrhagia or too frequent menstruation. These symptoms decrease in severity the further the tumour is situated from the endometrium.

If the uterus be more or less uniformly enlarged by an intramural fibromyoma, and the cavity be thus lengthened, haemorrhage without

much pain may be the prominent symptom. If the growth become very large pressure symptoms may be the most distressing feature of the case. Pressure on the ureter produces backache, and eventually kidney disease as indicated by albuminuria. The bladder, rectum and the nerves and veins of the pelvis may all be subjected to pressure, leading respectively to dysuria, tenesmus with constipation, sacralgia, sciatica and oedema of the legs.

Subserous growths produce symptoms of a mechanical nature, and therefore much depends on their size and situation. A tumour with a long pedicle springing from the fundus tends to wobble about, and may cause a good deal of bladder irritation. The patient can often feel the heavy tumour rolling about. If the growth be situated in Douglas' pouch pressure on the rectum not infrequently occurs.

With *cervical fibromyomata* the symptoms observed are due to their special position. When growing from the supravaginal cervix they may extend into the broad ligament and produce pain or pressure symptoms, especially by distortion or compression of the ureter; or, growing forward, they may give rise to frequency of micturition by pressure on the bladder.

Those which grow into the cervical canal form polyps, and are associated with bleeding. Cervical polyps may eventually be extruded through the external os in the same way, and with the same consequences, as have already been described in regard to polypi arising from the body of the uterus and subsequently extruded through the cervix.

Those growths which spring from the vaginal cervix tend to drag the uterus down and produce symptoms of prolapse, that is to say, backache, 'bearing-down' pain and dysuria.

Physical signs.—*Inspection* of the abdomen reveals many points of interest. We may be able to see quite a large regular or irregular protrusion, which may be of any size and even extend as high as the ensiform cartilage. Looked at from the side, the abdominal wall above a moderate or large sized tumour appears to drop away suddenly in a thin subject (fig. 83, p. 100). In a fat subject this is not so marked.

If the cervix be inspected with the assistance of a vaginal speculum a fibromyomatous polyp, which is either extruded or in the process of extrusion, can sometimes be seen.

On *palpation* we feel a hard and usually an irregular tumour, which may be quite movable from side to side. We may be able to detect a pedunculated subserous growth which moves with the main mass, but can also be moved independently within the limitations of its pedicle. With a patient in the Trendelenburg position—that is with the head lowered and the lower part of the trunk raised (see p. 447)

—we notice that the tumour cannot be pushed up out of the pelvis however movable it may otherwise be.

On *percussion* it is usual to find that the intestines lie between the diseased uterus and the abdominal wall. This is more especially the case when the tumour does not reach to the level of the umbilicus.

On *bimanual examination* we should be able to make a definite diagnosis not only as to the nature of the disease, but also as to the distribution of the growths. If the growth spring from the vaginal cervix it is almost always single, and the body of the uterus can be felt above it. If the tumour or tumours arise from the supravaginal cervix a round 'lump'—for a growth in this situation is also often single—can be felt, resembling the fundus of an anteverted uterus in the anterior fornix, or like that of a retroverted fundus in Douglas' pouch. If the growth be lateral in position it may be felt in the base of the broad ligament, or, if very large, occupying most of the pelvis and pushing the body of the uterus up into the abdomen. In these circumstances the cervix is high up and may be displaced to one side or the other.

When the growth forms a polyp, and is extruded through the cervix, a round mass surrounded by the lips of the external os can be felt in the vagina. But when the polyp remains in the uterine cavity the physical signs, if there be no other growths in the uterus, may consist only of an enlargement of the uterus with a softened cervix.

Fibromyomata situated intramurally can usually be detected as bosses on the surface of the otherwise smooth uterine wall. If there be pedunculated, subserous growths these can be felt attached to the uterus. Sometimes, however, it may be somewhat difficult to be sure of this point if the pedicle be long. As a rule, however, by grasping and moving, or pushing the pedunculated tumour with the hand on the abdomen, a corresponding movement imparted to the uterus can be felt by the fingers in the vagina.

Large tumours may become impacted in the pelvis, and therefore be immovable because they are situated within or behind the broad ligament; in these circumstances their nature must be diagnosed chiefly by their hardness and by the history associated with them. The whole uterus may, in some cases, be so elevated by being pushed up from below, or drawn up from above by growths too large to be contained in the pelvis, that the cervix is inaccessible to the examining fingers in the vagina.

Differential diagnosis.—This question is also best considered according to the position of the tumour.

Pedunculated subserous fibromyomata.—These may be easily mistaken for ovarian tumours, solid or cystic according to the consistence

of the growth. A diagnosis can usually be made owing to the fact that when there is a pedunculated subserous growth there are generally several other growths to be felt in the uterus, which may be itself much enlarged by intramural tumours. It is also sometimes possible to feel both ovaries *per rectum* if the uterus be not too large.

Again, a large tumour of the kidney, which has reached the pelvis, occasionally gives rise to difficulty in diagnosis. In these cases, however, there is often lumbar pain and blood in the urine. The tumour, too, can be felt to be independent of the uterus on bimanual examination.

Small sessile subserous, or intramural fibromyoma.—When small a solitary growth on the anterior (fig. 122, p. 151) or posterior wall may be mistaken for the fundus uteri. If projecting into the broad ligament the growth may be taken for a broad ligament cyst or parametritis. Again, if the tumour be situated at one of the uterine cornua, a diagnosis of bicornuate uterus may be made. Further, salpingitis with the tubes fixed in Douglas' pouch may sometimes give rise to difficulties.

In all these conditions careful bimanual palpation will usually reveal the fundus of the uterus which is of a different shape and consistence from the growth.

This is the first step in the diagnosis. In those cases, however, in which a diagnosis is not otherwise possible it may be expedient to pass the uterine sound with all due precautions. The direction and length of the canal, and the fact that there is only one canal, will prevent a mistake being made in regard to a bicornuate uterus, or a displacement of the fundus.

In parametritis there is always a history of an inflammatory attack almost invariably following full term parturition or an abortion, and the uterus is more or less fixed; whereas with a fibromyoma it is usually mobile.

There are two other conditions which may be confused with fibromyomatous disease of the uterus: early pregnancy, which is usually excluded by the fact that though the uterus may be uniformly enlarged there is no amenorrhoea, as is the case when the enlargement is due to pregnancy; and malignant disease of the body of the uterus —carcinoma, or more rarely sarcoma. In regard to the differential diagnosis in the latter case, both are associated with haemorrhages, but in the case of malignant disease there is also a foul discharge, unless this be retained and a pyometra exist. It is true, of course, that a sloughing submucous fibromyomatous polyp also gives rise to a foul discharge, so that some care may be necessary in making a diagnosis. Then again, as malignant disease of the body of the

uterus progresses bosses are not unusually found on the surface of the uterus, and these feel like subserous or intramural fibromyomata—indeed, such an uterus has been removed on several occasions without the operator being aware of the nature of the disease until the specimen was examined subsequently.

In distinguishing between the two conditions the main points to be noted are that a foul discharge without marked toxic symptoms or uterine pain is more in favour of malignant disease of the body of the uterus than of a sloughing submucous fibromyoma, especially if the patient be over fifty years of age, and have no previous history of menorrhagia during her menstrual life. It is very important, however, to remember that malignant disease frequently occurs in association with fibromyomata—a point which will be discussed presently.

A large fibromyomatous uterus may sometimes be mistaken for an ovarian cystic tumour. This is only possible when the fibromyoma has undergone 'cystic' degeneration and is of such a large size that the cervix is too high in the pelvis to make out its connexion with the tumour. As a rule the fact that the cervix is so drawn up is of itself evidence in favour of a fibromyomatous uterus. It must be remembered, however, that the cervix is also drawn up in pregnancy. This drawing up of the cervix is found to be increased in the case of the fibromyomatous uterus on placing the patient in the Trendelenburg position and pushing the tumour towards the upper abdomen.

Pregnancy has on many occasions been the diagnosis arrived at when the tumour was uniform in shape and soft. Especially is this the case when there has been a period of amenorrhoea or when it is suspected that any haemorrhage there may be is associated with a pregnant condition. As a rule, however, with pregnancy one can obtain a history of amenorrhoea corresponding to the duration of the pregnancy, and there may be the other signs of that condition. Nevertheless it must not be forgotten that in some cases of fibromyomata secretion can be obtained from the breast even in the absence of pregnancy.

Haematometra and pyometra with enlargement of the uterus may conceivably cause some difficulty, but the long period of amenorrhoea should prevent a mistake in the former case, while the latter is nearly always associated with malignant disease of the body of the uterus.

Hydatidiform degeneration of the chorion with bleeding, like pregnancy, may lead to difficulty. A careful consideration of the history, together with the rapid enlargement of the uterus, and its softness, will be of great assistance in arriving at a correct conclusion.

A *submucous fibromyoma*, when extruded into the vagina through the external os, must be distinguished from inversion of the uterus. On examination it will be found that the sound can be passed into the

cavity of the uterus past the pedicle of the tumour, and the fundus uteri can be felt in the normal position, indicating that there is no inversion. Further, there will be no history of a recent pregnancy, to which inversion is usually due. At the same time it must not be forgotten that an extruded submucous polyp itself frequently causes partial inversion of the uterus. When the polyp is contained in the uterine cavity the question of early pregnancy with threatened abortion, or even of the retained products of conception, may arise. The history of the case—such as the duration of the bleeding and absence of any period of amenorrhoea—will usually clear up the diagnosis.

Treatment.—We must now consider the proper treatment to be adopted in cases of fibromyomata that are in no way complicated by degenerative changes and associated conditions, which require special consideration.

It has already been mentioned that during recent years the treatment of fibromyomatous tumours of the uterus has undergone a marked change. It used to be thought—and that not many years ago—that with the menopause an amelioration in the patient's condition was almost certain to follow; it was supposed, in fact, that these growths only caused trouble during the fertile period of life. In those days ovaries were more or less indiscriminately removed to cause shrinkage of the growth, just as were testes in order to bring about the atrophy of enlarged prostates; or the patient was dosed with ergot until her extremities became blue, or heart failure threatened to follow the continued high blood pressure caused by this drug. This treatment by ergot was carried out in the hope that when the menopause arrived relief would be obtained. This, however, rarely happened, and many of the women who were advised to wait until that much desired epoch arrived in the meanwhile became chronic invalids, bedridden, perhaps demented, and always with an increasing belly-full of fibromyomatous growths. Owing to the previous advice operation advocated later was often refused, and the end of many of those patients has indeed been an object lesson as to the inefficiency of the old-time methods of treatment.

Later, Apostoli recommended electrical procedures, and in a certain number of cases permanent shrinkage was produced. But, owing to the frequency with which degenerative changes followed, this method of treatment has been abandoned by practically all gynaecologists. X-ray treatment is now being tried in Germany, and it is said to cause shrinkage of the growths. At the present time, however, the bulk of opinion is in favour of operative measures. There are, and always will be, certain cases in which such interference is not justifiable; for instance very old women, with harmless and often calcified and

symptomless tumours, should be left alone. A young woman anxious to have children should, if the growths be small and not causing any serious symptoms, be allowed to wait. Such a patient should be watched, especially if she become pregnant. Later in her life surgical interference may be advisable.

All cases that cause marked symptoms—that is pain, haemorrhages and pressure—must be dealt with surgically, unless there are grave contraindications.

The operation performed will depend on the situation of the growth or growths and the special features of the case. Polypoid or cervical (vaginal) growths can be dealt with by the vaginal route (see p. 501). Tumours in the body of the uterus can be treated by enucleation (see p. 461); if single and pedunculated they are easily removed. As a rule, however, abdominal hysterectomy (see p. 459) must be performed—and this is undoubtedly the best course to pursue in the majority of cases, for it is very unusual not to find numerous small growths (seedlings) scattered through the uterine wall in addition to the larger and more obvious tumours.

Most operators prefer supravaginal hysterectomy to the complete removal of the uterus. One ovary and a portion of the endometrium of the body should always be left, if at all feasible, in women under forty-five years of age, in order that menstruation may continue and the troubles of an artificial menopause be avoided.

There are one or two points which require careful consideration before proceeding to operation.

Very often the patient's general condition is bad. Either she is extremely anaemic from haemorrhage, or toxaemic from the absorption of the products of degeneration or sepsis. Consequently great care must be taken to get the patient thoroughly fit for operation, and no patient should be operated upon until her haemoglobin content has been raised to 40 per cent. of the normal. An examination of the urine will indicate also the condition of the kidneys. If there be albuminuria it is advisable to try what rest in bed for a fortnight, or even longer, will do to lessen the amount before proceeding to operation.

The results of surgical procedures at the present time are extremely good, and the mortality ought not to be above 1 per cent.

The relief to the patient is striking, especially if the ovaries, and sufficient endometrium to ensure subsequent menstruation, be left.

It can hardly be considered superfluous to reiterate the importance of the fact that fibromyomata are rarely harmless even if uncomplicated when first discovered, and that serious consideration should always be given at the earliest possible date to the question of operative interference.

Having discussed fibromyomata in their most innocuous state we

must now turn to a consideration of many of the serious complications that are liable to confront us, and frequently do, in connexion with these growths.

Complications of fibromyomata uteri.

Fibromyomata and pregnancy.—It is necessary to draw a clear distinction between the effects that fibromyomata may have on pregnancy and the effects pregnancy may have on preexisting fibromyomata.

Effects of fibromyomata on pregnancy.—It is well known, in the first place, that fibromyomata tend to produce relative or absolute sterility. This is probably the case in about two-thirds of all married women who possess these tumours. It is somewhat difficult accurately to gauge these figures, for it stands to reason that in those cases in which the patient marries young, before the fibromyomata have appeared, or before they have attained to any great size, the chances of pregnancy are greater than in those who marry later in life when the uterus is, perhaps, extensively invaded by fibromyomatous growths.

When the sterility is absolute it is for one of the following reasons: there is coexisting tubal disease, or such distortion of the tubes that conception is impossible; or an adenomatous condition of the endometrium, which is usually found with fibromyomata and frequently is associated with haemorrhages, rendering impregnation or implantation of the ovum impossible.

The sterility may be relative in that conception, although the conditions are unfavourable, may occur. In these circumstances abortion is frequent, owing to the contorted shape of the uterine cavity or the impaction of the uterus in the pelvis; to the presence of polypi; or to the imperfect implantation of the ovum and insufficient attachment and vascularization of the placenta; or because there is not sufficient muscle tissue to allow proper expansion of the uterine walls.

But in spite of great impediments pregnancy not only does occur, but even goes to full term, in quite a large number of cases. When the pregnancy passes the ordinary period at which abortion usually occurs—*i.e.* within the first 8 weeks—the practitioner may be faced with a variety of interesting situations in regard to the prospects of a continuation of the pregnancy with the survival of the child, and the possibility of interference being necessary for the sake of the mother.

First of all in regard to the continuation of the pregnancy. It is obvious that there are many cases in which a live child is a matter of the greatest importance; so that putting aside for the moment the question of the mother, whose welfare must, however, always be paramount, the following contingencies suggest themselves.

Firstly, we may be concerned as to whether there is a cervical tumour which will prevent the child passing through the pelvis during parturition. All other things being equal there is no reason to terminate pregnancy on account of cervical fibromyomata, no matter to what extent the pelvis may be filled. In these cases the proper course to pursue is to perform Caesarean section at full term, and, after the child has been thus rapidly and safely delivered, to remove the uterus together with the growth arising from it.

Of course if the growth be a pedunculated subserous one, and have dropped into the pelvis, it should be removed by abdominal section as soon as discovered, and the pregnancy allowed to continue. Likewise a cervical polyp presenting in the vagina can sometimes be removed without interrupting the pregnancy.

Secondly, we may have to consider those cases in which there are numerous large growths almost filling the abdomen, and in which it is obvious that there is no room for the growth of the foetus to continue. Once we have made up our minds on this point, the sooner the uterus and its contents are removed the better; for if the foetus die infection may follow with disastrous results. Figure 223 is an illustration of a

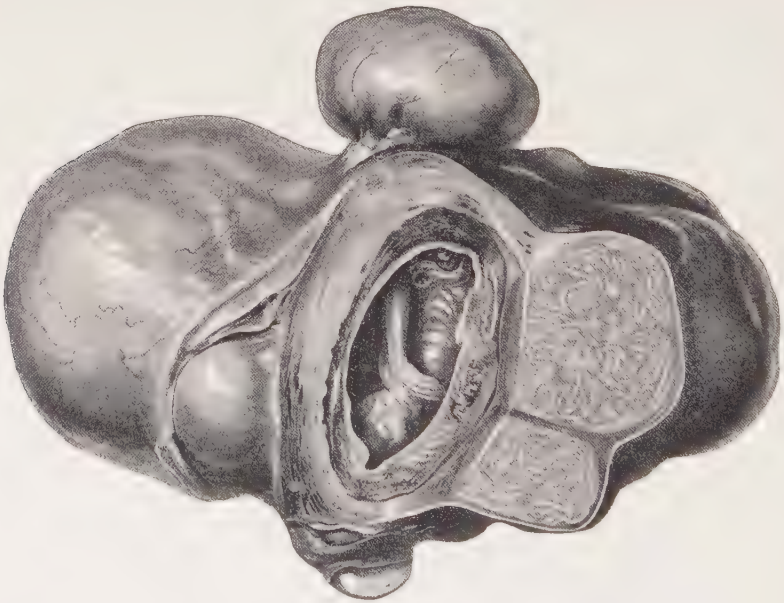


Fig. 223.—Fibromyomatous uterus—removed by supravaginal hysterectomy—containing a foetus fifteen weeks old. The foetal membranes are seen protruding through the cervix.

case of this kind. It will readily be seen that the three months old foetus could not have gone on growing.

Then there is another type of case of the same nature but even more serious. An instance of this is illustrated in figure 224. The fibromyomatous uterus with the contained five months old foetus was removed, not only because the foetus could not have grown much larger, so little room was there, but also on account of the large cervical growth which so completely filled the pelvis that a glass catheter could not be passed into the bladder. Had the foetus died *in utero*, as must have happened before long, there would have been no room for its expulsion, and very disastrous consequences might have resulted.

Fig. 224.—Fibromyomatous uterus containing a five months old foetus. Note in the lowest part the large tumour that filled the pelvis. The cervix, much elongated, is seen cut across.

When the pelvis is not blocked by such a growth, and there is a reasonable doubt as to whether the pregnancy is likely to continue until the foetus is of viable age, operation should be deferred, and the case carefully watched, so that interference may be carried out at any moment if necessary in the interests of the mother.

After parturition there are always grave risks of haemorrhage, from imperfect contraction and retraction of the uterine wall, and of sepsis (*vide infra*); so that in the opinion of most surgeons it is wiser, when there are large intramural growths, to terminate the pregnancy artificially by Caesarean section at full term and to perform hysterectomy after the delivery of the child.

There are, nevertheless, many cases in which there is no need for anxiety, and in which interference is unnecessary so far as pregnancy and parturition are concerned. These are the cases in which there are subserous growths situated on the fundus or in the upper parts of the body of the uterus, or where the tumours in other situations are so small that it is extremely unlikely they will cause any complication during either pregnancy, parturition, or the puerperium.

Thus, to summarize, the practitioner has to make up his mind to one of the four courses of action open to him.

(1) The performance of Caesarean section followed by hysterectomy when a viable child can be obtained without undue risk to the mother.

(2) The removal of pedunculated growths in the pelvis or vagina without the interruption of pregnancy.

(3) Removal of the uterus and foetus when viability is impossible or the risk to the mother too great.

(4) Non-interference.

Effect of pregnancy upon fibromyomata.—Pregnancy is responsible for many changes of considerable importance in fibromyomata. These changes may be classified under two headings: degenerations and infections. Since we must discuss these conditions not only in relation to pregnancy, but in all their bearings as frequent complications of fibromyomata, it is unnecessary to say more here than that pregnancy is a common causal, or predisposing, factor in many of these changes.

Degenerations of fibromyomata.—Owing to the incomplete state of our knowledge we must classify the degenerations into two chief groups.

(a) **Degenerations due to interference with the blood supply. Venous obstruction.**—**Oedematous degeneration** is frequently seen, and is most often found in those tumours which have been subjected to pressure. In such circumstances the venous circulation is impeded while the arterial is not interfered with to the same extent. Figure 225 is a microscopical section of an oedematous fibromyoma.

As degeneration proceeds cystic cavities may be formed, leading to what is known as '*cystic degeneration*' (fig. 226).

The **symptoms** are those of a rapidly increasing tumour with pain.

The **treatment** consists of removal of the uterus.

Arterial insufficiency.—**Atrophy** occasionally occurs in fibromyomata but probably only in *small* tumours at the menopause.

Hyaline degeneration is seen to some extent in most fibromyomata and results from a slight or gradual impairment of the nutrition. Figure 227 is a photomicrograph of this change, which is of little clinical importance *per se*.

Necrobiosis is hardly a distinct entity, for any change producing extensive interference with the nutrition results in death of the part concerned, so that this process must be looked upon as the final stage of the degeneration resulting from arterial obstruction.

Pain is a marked and constant symptom of this form of degenerative change. There is often also a rapid increase in the size of the

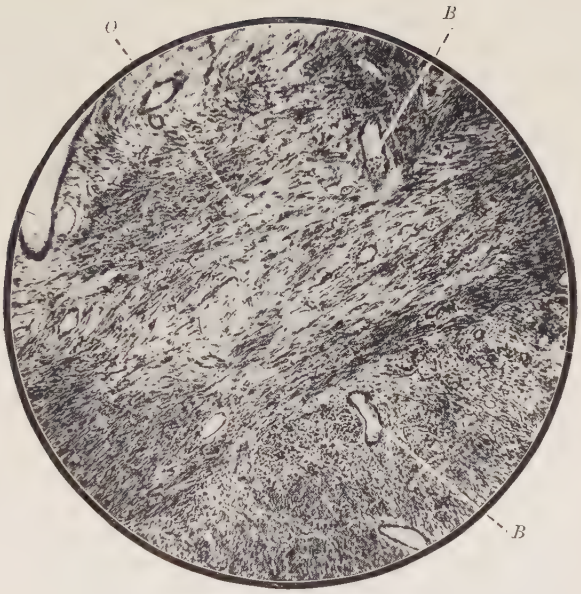


Fig. 225.—Section of an oedematous fibromyoma. ×100.
(*Photomicrograph.*)

O. A patch of oedema showing the tumour tissues broken up by the exudation.
B. Blood vessels.

Fig. 226.—'Cystic' (oedematous) degeneration in a large fibromyoma.

growth, and the practitioner should always be alive to these important symptoms, which demand immediate removal of the disease.

Fatty degeneration is not uncommonly seen, but is usually quite limited in extent and associated with necrobiotic changes.

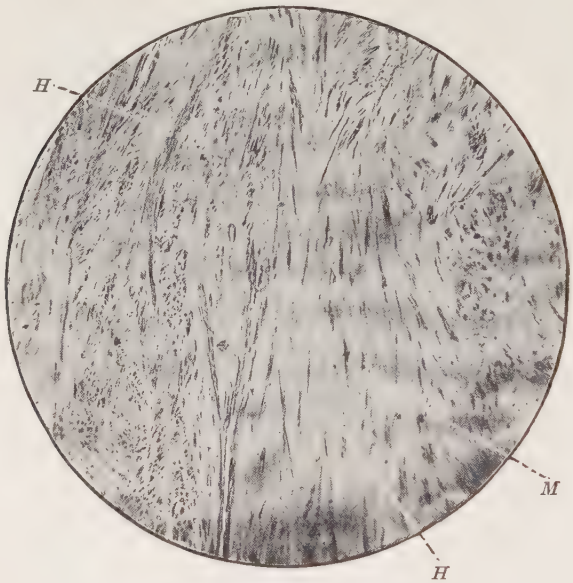


Fig. 227.—Hyaline degeneration in a fibromyoma of the uterus. *H* shows the areas of hyaline degeneration, in which the compressed and isolated muscle fibres may be seen at *M* in longitudinal section, and to the left of the field in cross section. ×300. (*Photomicrograph.*)

(b) **Unclassified degenerations.**—**'Red degeneration.'**—This curious change, which has recently been somewhat fully investigated, occurs for the most part in intramural growths, although it has occasionally been observed in subserous or submucous tumours with broad pedicles. In appearance on macroscopical section the growth is of a dusky red colour, sometimes almost purple, throughout the whole or a portion of its substance. The tumour possesses the disagreeable odour of stale fish.

Microscopical examination indicates that there is usually thrombosis and dilatation of the vessels, and in some instances haemorrhage into the substance of the growth is found (fig. 228). Bacteria are often present, probably as an infection subsequent to the degeneration.

Many believe that pregnancy plays the most important predisposing part in the production of this condition, and indeed it is frequently associated with that state; at the same time this degeneration has been known to occur quite independently of pregnancy. The remarkable

frequency of the association between the two should, however, put the practitioner on his guard not only during pregnancy, but also during the puerperium, if his patient have fibromyomatous growths in the uterus.

The **symptoms** of this change are pain produced by a tumour previously giving rise to none, and in many cases toxaemic manifestations often accompanied by a rise in temperature. The cause of the toxaemia is uncertain; some authorities believe it to be bacterial in

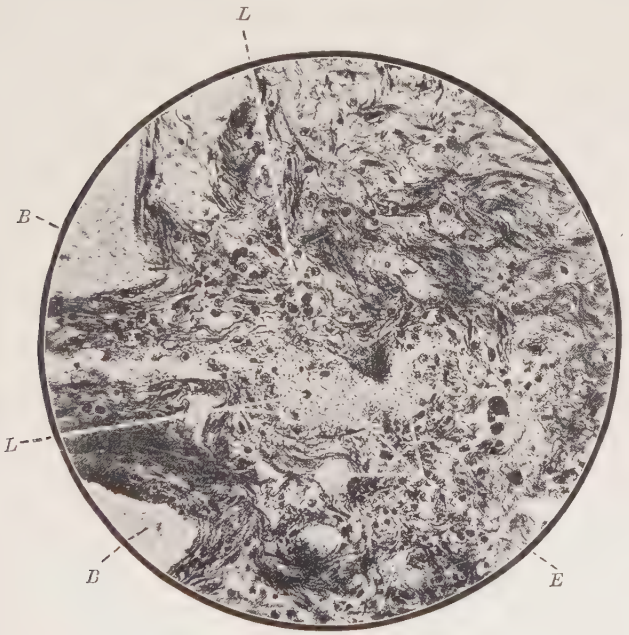


Fig. 228.—'Red degeneration' in a fibromyoma. ×300. (*Photomicrograph.*)

B. Dilated and thrombosed blood vessels. *E.* Blood extravasated into the tumour tissues. *L.* Leucocytes.

origin, but it is doubtful if this be always the case. So serious may these symptoms become that interference is often necessary even during the progress of pregnancy.

Treatment.—A fibromyoma which is undoubtedly causing considerable pain should always be removed during pregnancy, so dangerous is this form of degeneration. It is wiser to remove the uterus unless the pregnancy be well advanced, when enucleation of the tumour may sometimes be attempted. In one case death occurred from toxaemia immediately following parturition, about two months after the enucleation of one of these growths had been accomplished late in pregnancy.

In the puerperium and in the non-pregnant state the uterus should always be removed.

Myxomatous degeneration was at one time considered to be common, owing to the mistaken idea that ordinary oedematous changes were of a myxomatous nature. This form of degeneration is now known to be very rare, and its occurrence can only be asserted when the spider cells of myxomatous tissue are demonstrable.

Calcareous 'degeneration' must be mentioned here although it cannot properly be classified as a degeneration if we wish to be scientifically accurate, for the condition of calcification occurs as a sequel to the deposition of calcium soaps in diseased structures of all kinds. Indeed, it is probably always a reparative process.

Calcification of fibromyomata occurs in two ways: either by the deposition of calcareous material around the circumference of an intramural growth, like an egg-shell (fig. 229); or by the interstitial infiltration of a pedunculated tumour. We recognize in the latter the solid calcareous masses known in olden times as 'womb stones.'

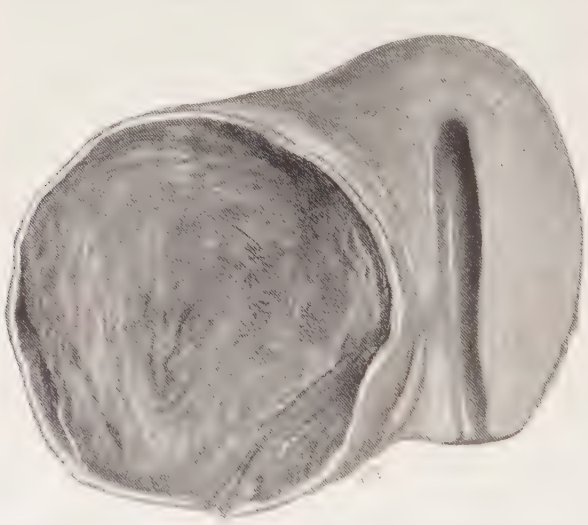


Fig. 229. – Fibromyoma uteri enclosed in a calcareous capsule ('egg-shell calcification').

No special **symptoms** are associated with the calcification of fibromyomata apart from the mechanical difficulties that may arise.

When found in old women and in the absence of symptoms calcified fibromyomata require no treatment.

Torsion of fibromyomata.—Twisting of the pedicle of a subserous fibromyoma is not a common accident, for the pedicles are usually

short and thick. When it does occur the symptoms vary considerably according to the structural condition of the growth at the time of the accident. A very hard non-vascular, perhaps calcareous, growth may have its pedicle twisted without producing any effect upon the tumour itself, which may in time become entirely separated from the uterus. If the tumour be soft and actively growing, the stasis produced in the veins may lead to haemorrhage into it, when the symptoms resemble those produced by a twisted ovarian pedicle (see p. 347).

It is, however, not unusual to see cases in which a partial or temporary rotation produces pain which soon disappears. Attacks of this kind may occur at frequent intervals.

There are instances on record in which the complete fibromyomatous uterus has undergone torsion. In these a haematometra has sometimes been formed.

Infection of fibromyomata.—It is probably necessary for a fibromyomatous tumour to be injured in some way, or to undergo a certain amount of degeneration, before infection can occur. Thus so long as a submucous polyp remains uninjured and with a good blood supply it does not become infected; but as soon as it is extruded through the cervix and the blood supply interfered with, it becomes septic and sloughs. This is probably the commonest variety of infected fibromyoma, so that the chief predisposing factors of infection are interference with the blood supply and degeneration.

Pregnancy also is indirectly responsible for many cases of infected tumours. In these circumstances the infection may be acute or subacute. If the growth be a submucous one the case is usually of an acute nature, for the tumour is not only injured by interference with the blood supply but stands a greater chance than usual of extrusion and subsequent infection during involution. When there is a foul discharge and bleeding during the puerperium, together with general symptoms of septic absorption, a careful examination of the interior of the uterus is always made in order to find out if there be any placental tissue left behind; so no difficulty should be experienced in making a correct diagnosis, for the rough and sloughing fibromyoma can easily be detected by the fingers in the uterus while the other hand exerts counter pressure on the abdominal wall. If in these acute cases the growth can be reached easily, the uterus should be well douched for several days with weak iodine solution in order to reduce the virulence of any infection that may be present. An attempt may then be made to drag the growth down through the cervix and to enucleate it; or the sloughing portion may be scraped away. Care must be taken not to perforate the uterine wall. The cavity of the

uterus is subsequently packed with iodoform gauze, and hysterectomy performed as soon as it is considered safe if any part of the growth remain, or if there be any other growths in the uterine wall.

When an intramural growth becomes infected during the puerperium there may be no bleeding or discharge, the only symptoms being pain and those associated with a septic toxaemia. An abscess may form in the growth. In these circumstances hysterectomy should be performed.

In the more chronic forms of infection the process spreads from the bowel or appendix, and occurs either in connexion with degenerated tumours which have become adherent to those structures, or from the adhesion of inflamed bowel or appendix to the tumour. Hysterectomy should be carried out as soon as possible in these cases.

Intraperitoneal haemorrhage from fibromyomata.—Several cases have been reported in which a pelvic haematocele has formed as the result of the rupture of a large vein coursing over the tumour. It is advisable to operate upon such cases immediately, and to remove the tumour.

Tubal and ovarian disease complicating fibromyomata.—Salpingitis, from infection of the uterine cavity due to sloughing submucous polyps, is probably not uncommon.

During the performance of hysterectomy one is frequently hampered by the adhesions, the result of the tubal infection. These adhesions often bind the fibromyomatous uterus down, and lead eventually to oedematous changes in the tumours.

Cystic ovaries, too, are very commonly found; sometimes they are due to oedema and sometimes to oöphoritis or to concurrent adenomatous disease.

Malignant disease complicating fibromyomata.—In spite of many positive assertions it has never been conclusively shown that malignant changes ('degeneration') occur in fibromyomata. That cancer of the body of the uterus is a complication sometimes to be met with in fibromyomatous uteri is well known. So well known and easily recognized is it that no fibromyomatous uterus should be removed by supravaginal hysterectomy—the operation of election of most surgeons—unless the organ be opened immediately after removal, in order that the operator may also remove the cervix forthwith if there be any suspicion of cancer of the endometrium.

So, too, in regard to sarcoma, there is no doubt that this growth occurs in fibromyomatous uteri; and there is more reason to believe

that such a change can arise as a 'degeneration' than in the case of carcinoma.

In the present state of our knowledge it is impossible to say more than that carcinoma and sarcoma may *complicate* fibromyomata of the uterus, or that carcinomatous changes may occur in adenomyomata—to be discussed presently; and that sarcomatous changes may take place in soft, rapidly growing myomata.

The **symptoms** are essentially those of malignant disease of the uterus, and if it be impossible to exclude a sloughing submucous growth a diagnosis can be made by the microscopical examination of a fragment obtained by curetting.

The **treatment,** of course, consists of performing panhysterectomy with the removal of the appendages as soon as possible.

Constitutional disturbances associated with fibromyomata.—Before dismissing the subject of fibromyomata, which has been dealt with at some length owing to the importance of it to every practitioner, it is necessary to add a word concerning the constitutional effects these growths may produce. In a vast majority of the cases the local symptoms overshadow the general ones, yet there are quite a number of women in whom the constitutional symptoms are marked.

Anaemia is, of course, at once the commonest and the most important. As has already been said, no woman should be operated upon who has a small percentage (under 40 per cent.) of haemoglobin in her blood. This anaemia is best treated by rest in bed and the administration of iron, together with calcium lactate if the bleeding continue, until such time as the patient is fit to undergo operation.

After removal of the uterus recovery is rapid.

Vascular system.—Sometimes the heart and blood vessels undergo marked degeneration of their muscular tissues; no satisfactory explanation has been offered for this change, which may occur in women who have not been subject to excessive haemorrhages. It is, in fact, probably coincidental.

Nervous system.—Many women with fibromyomatous uteri are extremely neurotic and occasionally the condition is associated with insanity, when the patient may imagine that she is pregnant. Removal of the uterus sometimes, though not always, cures the patient of her nervous or mental symptoms.

ADENOMYOMATA AND ADENOFIBROMYOMATA.—These growths have recently been separated from ordinary fibromyomata and placed in the position of a distinct pathological variety. The condition is found alone, or in association with fibromyomatous tumours elsewhere

in the uterus. It occurs most frequently between the ages of thirty and fifty years, resembling in this respect ordinary fibromyomata. The subjects are often nulliparous, although cases are on record in which the patient has borne children.

The **symptoms** consist of menorrhagia of a particularly severe character with a good deal of menstrual pain, intermenstrual haemorrhage and leucorrhoea.

The uterus itself is generally somewhat uniformly enlarged and of a softer consistence than is found in an ordinary fibromyomatous organ. This is particularly the case when the disease is widespread and diffuse. The tumour may, however, arise in, and be limited to, one wall of the uterus, or it may merely consist of a small polyp projecting into the cavity of an otherwise healthy or a fibromyomatous uterus. Figure 230 is an illustration of this growth.

Fig. 230.—Localized adenomyoma in the posterior wall of the uterus. (*Natural size.*) (*Bland Sutton.*)

Microscopically the characteristics of this disease are readily demonstrated (fig. 231); gland tubules lined with columnar epithelium are scattered in a stroma consisting of connective and fibrous tissues, and muscle fibres. These glands arise from the endometrium, so that the growth is an adenoma of the endometrium which has invaded, or become invaded by, a myoma or fibromyoma of the uterus At the commencement the growth may have an accidental origin in so far as the glandular elements are incorporated with myomatous development.

Subsequently the glands in the tissue proliferate and dilate, and the two growths—myoma and adenoma—together form a simple mixed tumour.

Fig. 231.—Adenofibromyoma of the uterus. In the fibromyomatous stroma are many glands, some (*G*) only slightly dilated, others (*G'*) very much distended. It will be noticed that there is practically no distortion in the shape of the glands. × 75. (*Photomicrograph.*)

The **diagnosis** can only be made for certain with the microscope, and in most cases the uterus is removed under the impression that the tumour is of a soft fibromyomatous nature.

The macroscopical inspection, however, reveals the fact that the growths are usually diffuse and non-encapsuled, and have not the whorled appearance of the ordinary fibromyomata.

Microscopically it is necessary to distinguish these tumours from adenocarcinomata, in which the glands are more complex, contain many layers of epithelium and are not separated from one another by connective tissue.

The **treatment** consists of hysterectomy.

TELANGIECTATIC MYOMA.—This is a somewhat rare variety of tumour. The structure is that of a soft myoma or fibromyoma in the substance of which are numerous blood vessels or cavernous spaces

(fig. 232). Structurally these growths somewhat resemble the cavernous appearance often seen in the normal uterus in infancy, so that possibly they may be of congenital origin to a certain extent. Further the structure of telangiectatic myomata is evidence in favour of the view, already mentioned, that fibromyomata originate from the walls of blood vessels.

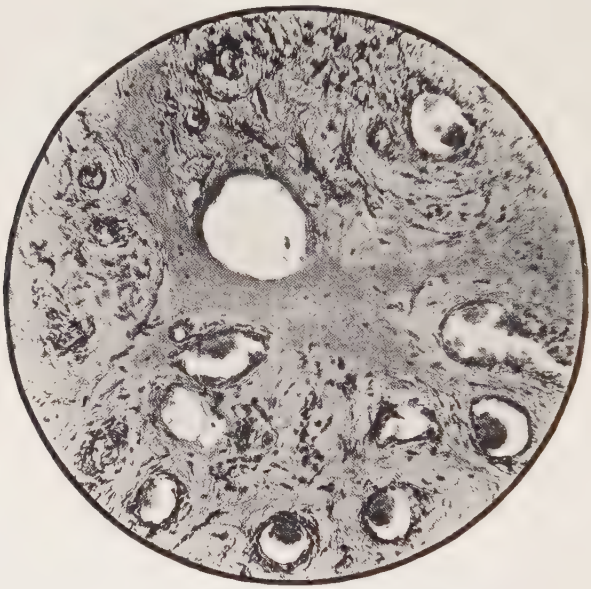


Fig. 232.—Section of a telangiectatic fibromyoma of the uterus. A great number of enlarged blood vessels are to be seen scattered through the fibromyomatous tumour, in which fibrous tissue is in excess of the myomatous. ×150. (*Photomicrograph.*)

These tumours are very soft, almost cystic to the touch and non-encapsuled. It is advisable to remove the whole uterus, for some of them appear to be sarcomatous. In the case from which the above section was taken there was an ordinary pedunculated subserous fibromyoma present in the uterus as well as the more complex growth.

§ iv. INNOCENT GROWTHS OF THE ROUND LIGAMENTS.

LIPOMATA, while probably not actually arising from the round ligaments, are sometimes found in close association with them, and originate in the subperitoneal tissues. These growths are nearly always found in the inguinal canal or in the upper part of the vulva. They cause no symptoms unless they be of large size. Their removal is a simple matter.

FIBROMATA AND FIBROMYOMATA, AND EVEN ADENOFIBROMYOMATA, are occasionally met with. They sometimes arise from the round ligament in the inguinal canal, but more frequently they have been found in connexion with the intraabdominal portion of this structure near the uterus (fig. 233). Clinically they are easily recognized if they occur in the inguinal canal; for the mobility, the lobulated form, hard consistence, long duration, and absence of impulse on coughing prevent them from being confused with anything else.

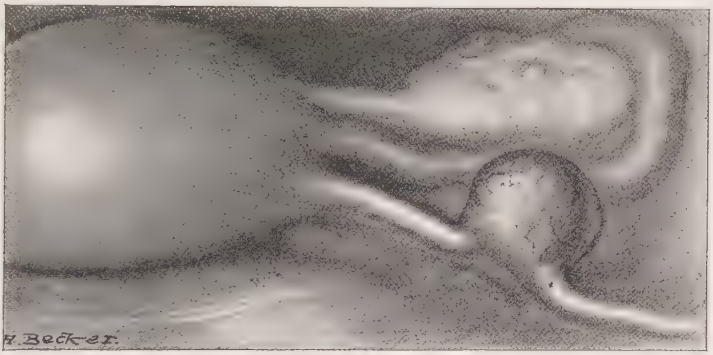


Fig. 233.—Myoma of the round ligament. (*From Kelly's and Cullen's 'Myomata of the Uterus.'*)

If the tumour spring from the intraabdominal portion of the round ligament it is often impossible to distinguish it clinically from a subserous fibromyomatous growth arising from the uterus.

There are no symptoms apart from those caused mechanically by a very large tumour, which may give rise to frequency of micturition and possibly other pressure symptoms.

The treatment consists of excision. If the growth be in the inguinal canal the healthy proximal cut end of the round ligament should be sutured to Poupart's ligament; and when an intraabdominal growth is excised the cut ends of the round ligament should be made to meet if this be possible, the ligament of the other side being shortened to correspond (see p. 465).

§ v. INNOCENT GROWTHS OF THE FALLOPIAN TUBES.

Many varieties of tumour have been recorded by different observers, but it is doubtful if all of them really arise from the tube itself.

LIPOMATA sometimes are seen in close association with the tube,

but as in the case of lipoma of the round ligament it is probable that they arise from the extraperitoneal fat.

FIBROMYOMATA AND MYOMATA are extremely rare, but morphologically there is no reason why they should not be much commoner, for the muscular tissue of the Fallopian tube is continuous with, and is derived from the same source as, that of the uterus itself.

ADENOMATA are occasionally found as polypoid growths inside the tube, or even as a diffuse growth causing considerable enlargement of the part. These tumours arise from the mucous membrane. When the growth is very exuberant a papillomatous condition is found; this gives rise to a plentiful watery secretion. Hydroperitoneum may also be produced, but there is no direct evidence to show whether this be caused by the irritation of the secretion or be the secretion itself escaping from the ostium abdominale. It has been stated that if this orifice be closed intermittent watery discharges take place into the uterine cavity and thence to the exterior.

In these cases the question may arise as to whether the growth be innocent or malignant. There appears to be some authority for saying that they may be innocent in the first instance and subsequently take on malignant changes.

Treatment.—The whole tube should be removed by the operation known as salpingectomy (see p. 472).

§ vi. INNOCENT GROWTHS OF THE BROAD LIGAMENT.

These may be *cystic* or *solid*.

CYSTIC GROWTHS that arise in the broad ligament, apart from the retention cysts already described, are always papillomatous in nature, and they arise from the parovarium, the paroöphoron, or from Gartner's duct. They may attain to a considerable size, and give rise to the same symptoms as broad ligament retention cysts.

Sometimes the intracystic papillomata make their way through the cyst wall and give rise to secondary implantations on the surrounding peritoneum and organs. Hydroperitoneum is always a sequel to this occurrence—a fact which may assist in making a correct diagnosis.

When these cysts arise from the lower part of Gartner's duct they spread between the layers of the broad ligament, and tend to lift the uterus up and to push it over to the opposite side.

Parovarian papillary cysts usually grow away from the broad ligament by which they are enclosed, and have a distinct pedicle, which facilitates removal. Sometimes, however, they are found invading the broad ligament, and attached to the surrounding structures.

These growths at times apparently become malignant.

Microscopically the papillary outgrowths from the cyst wall are seen to be lined with a single layer of low columnar epithelium (fig. 234).

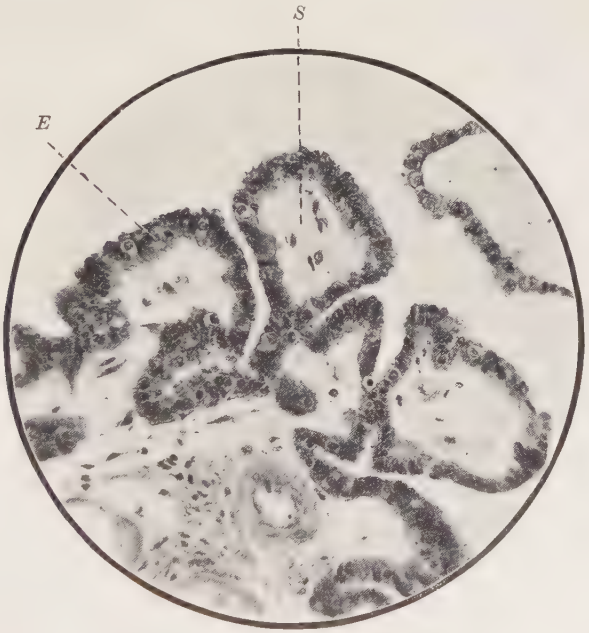


Fig. 234.—High power view of papillomata in a broad ligament cyst. ×220. (*Photomicrograph.*)

S. Loose connective tissue stroma. *E.* Columnar epithelium covering the outgrowth. This epithelium is almost cubical in shape.

Treatment.—The tumour must be carefully shelled out and removed unopened if possible, for should the papillomatous growths escape they may become implanted upon the peritoneum.

The complete removal of papillomatous cysts is often a matter of considerable difficulty, for when the papillomatous growths have got beyond the confines of the cyst wall they form a friable and adherent mass in the pelvis.

SOLID GROWTHS are usually **fibromyomata**, and there is much doubt as to their origin. Some authorities think that they originate from the uterus, and subsequently become separated from their source

of origin. Others think that they arise independently, from the subperitoneal muscle fibres of the broad ligament.

They may grow to a considerable size and are usually diagnosed as fibromyomata of the uterus.

Lipomata of the broad ligament are occasionally met with.

The **symptoms** of solid growths of the broad ligament are chiefly those caused by pressure.

Treatment consists of shelling these tumours out from their peritoneal surroundings.

§ vii. INNOCENT GROWTHS OF THE OVARY.

These may be conveniently divided into those which are *cystic*, and those which are *solid*.

INNOCENT CYSTIC GROWTHS OF THE OVARY may again be subdivided into the following varieties:

(1) Those arising from the oöphoron (cystadenomata, and simple multilocular cysts).

(2) Those arising from the hilum (papillomata).

(3) Lutein cysts.

(4) Cystic teratomata (dermoid cysts).

Cystadenomata (proliferous, glandular cysts of the ovary).

These are the ordinary ovarian cysts—usually multilocular—so often met with. They are not infrequently bilateral, and usually arise during the period of sexual activity. Their origin is at present a matter of speculation; but since the cells lining the Graafian follicles arise from the stroma of the ovary the old view that cystadenomata are derived from the membrana granulosa cannot be correct. It is much more probable that they originate from remains of the Wolffian body.

The tumour presents a dull mottled grey appearance, and if there be daughter cysts these are generally more translucent than the main cyst. In a multilocular cyst the daughter cysts are numerous and may cause the outline of the tumour to be irregular. The septa between the various cysts may disappear. Sometimes cystadenomata are unilocular. As a rule a distinct pedicle is formed by the attachment of the ovary to the broad ligament (fig. 235), and unless the cyst be impacted in the pelvis or the growth extend into the broad ligament the relation of the ovary to the Fallopian tube is undisturbed.

In either of the unusual circumstances mentioned the tube becomes stretched over the tumour (see fig. 135, p. 169).

There are two varieties of cystadenomata—the pseudomucinous and the serous.

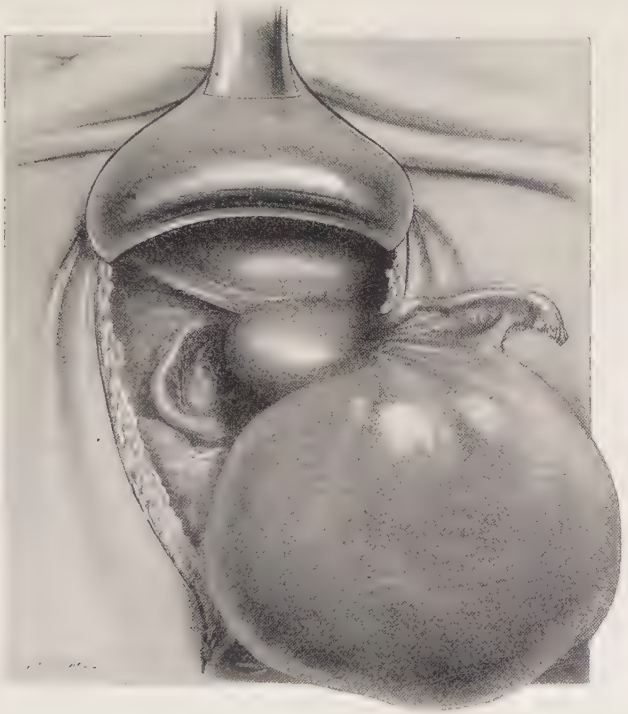


Fig. 235.—Ovarian cyst of the right side, as delivered through the abdominal incision at operation. The pedicle is well seen.

Pseudomucinous cysts are in the early stages lined with high columnar epithelium, among which darkly stained 'goblet' cells may be seen; but as they gradually get larger the epithelium becomes flattened out by pressure. Intracystic outgrowths are not uncommon. They have a fibrous stroma continuous with that of the cyst wall and are covered with a single layer of columnar epithelium (fig. 236). The glandular nature of adenomatous cysts is also well shown in the solid portions which are found in these tumours (fig. 237). The cyst wall itself is mainly composed of fibrous tissue, and theoretically should be covered with germinal epithelium, but practically this is not seen. The fluid contained in these tumours is usually extremely viscid, due to the presence of pseudomucin secreted by the epithelial cells. Sometimes, however, the fluid is not very sticky and it may be bloodstained owing to intracystic haemorrhage, which frequently occurs.

Fig. 236.—Intracystic fibrous growths in an ovarian cystadenoma. The stroma of these is continuous with the fibrous stroma of the cyst wall. ×100. (*Photomicrograph.*)

W. Cyst wall. *S*. Stroma of outgrowths. *E*. Columnar epithelium covering the growths. *P*. Group of outgrowths.

Fig. 237.—Section through a solid adenomatous portion of the wall of a cystadenoma of the ovary. ×100. (*Photomicrograph.*)

G. Glands lined with high columnar epithelium (*E*) and 'goblet' cells, and containing pseudomucin. *F*. Fibrous tissue of cyst wall.

It varies greatly in colour from a deep brown or green to a pale straw or yellow shade.

Serous cystadenomata contain fewer loculi and are more slowly growing than the pseudomucinous cysts. They are lined with columnar epithelium which is ciliated when the cysts are small. The fluid in these tumours is usually yellow or green in colour, and is of much lower specific gravity than that in pseudomucinous cysts; it contains albumin but no pseudomucin.

Adenomatous cysts are found in women of all ages but are rare before puberty.

Simple multilocular cysts (fig. 238) arise from the formation of many cysts in the ovary at the same time. The fluid contents of these is of a low specific gravity. The cysts may coalesce by the breaking down of the intervening cyst walls. When these tumours are small and bilateral they have been known as Rokitansky's tumour. Some authorities think that simple multilocular tumours develop into the adenomatous variety.

Fig. 238.—Simple multilocular cystic tumour of the ovary.

The **symptoms** of cysts of the oöphoron vary considerably. Some patients have none, except the discomfort of a gradually enlarging abdomen. Married women sometimes attribute their condition to pregnancy, especially when there is amenorrhoea. The rate of growth varies considerably in different cases, and is apparently influenced to a

large extent by the age of the patient. In young women the cysts grow rapidly, and the abdomen may be 'full' in eight or nine months. In older women the progress is slower, so that a woman may have had a tumour for eight or nine years without it having reached to the level of the umbilicus. The chief symptoms, if nothing happen to the growth, arise from pressure, first on the bladder and rectum, and later on the large veins within the abdominal cavity; and finally on the diaphragm.

Difficulty in micturition and defaecation are most marked when the tumour falls into Douglas' pouch and, becoming impacted there, elevates the uterus and pushes it up against the symphysis pubis. In these circumstances the bladder becomes an abdominal organ (see fig. 135, p. 169). Owing to the pressure in the pelvis, sacralgia and even sciatica are frequently complained of.

When the tumour becomes so large as practically to fill the abdomen, and to interfere with the venous circulation, the legs may become oedematous and the respiration be seriously impeded. Cysts of such a size are rarely seen in the present day, but occasionally they come under the care of the gynaecologist after they have been tapped two or three times in the belief that the enlargement was due to free ascitic fluid.

Diagnosis.—It will be convenient to consider the diagnosis under the following headings:

(1) When the tumour is entirely pelvic.
(2) When the tumour is entirely abdominal.
(3) When it is both pelvic and abdominal.

When the tumour is entirely pelvic.—In the very early stages the cyst may drop down into Douglas' pouch, or it may remain at the brim of the pelvis. Menorrhagia may be the only symptom. On bimanual palpation a freely movable, rounded and cystic tumour can be felt between the examining fingers. It is made out to be quite independent of the uterus. In order to be sure of this fact the cervix uteri is grasped between the first and middle finger and manipulated so as to produce movement of it away from the cystic swelling: no movement of the latter can be detected. Sometimes inflammatory adhesions bind the cyst to the uterus, but this is not common when the cyst is quite small. At other times the enlarging cyst becomes impacted in the pelvis, and pushes the uterus forwards; more rarely the growth may be situated in front of the uterus and push that organ backwards.

A *small parovarian cyst*, or a *hydrosalpinx*, may easily be confounded with a cyst of the ovary, unless one can make out on bimanual palpation that there is an ovary independent of the cystic

swelling, as is the case in both the other conditions. In hydrosalpinx there is usually a history of long-standing pain.

Further, in regard to the diagnosis from a parovarian retention cyst, one can only say that the latter contains much thinner fluid, is unilocular, and is rarely so tense as the multilocular cyst.

A *solid tumour of the ovary* can hardly be confounded with a cystic one.

As the tumour in the pelvis grows it may gradually fill the pouch of Douglas and posterior half of the true pelvis, in which case pressure symptoms begin to make their appearance, and as a rule inflammatory adhesions fix the tumour to the surrounding structures. In these circumstances diagnosis becomes more difficult. On abdominal palpation a tumour may be felt rising out of the pelvis and to be of a cystic nature. One frequently finds that the bladder is well above the pelvic brim, so that if it contain urine there is dulness on percussion over it. Also on bimanual palpation the cervix is felt to be high up—in extreme cases almost out of reach—under the symphysis pubis. The body of the uterus cannot be made out clearly, although the fundus may sometimes be felt by the examining hand on the abdomen. On attempting to move either the uterus or the tumour independently of one another, this is found to be impossible. Often the uterus lies in a groove, as it were, on the anterior surface of the cyst. As a rule it is not difficult to make out that the tumour is cystic; this is especially the case when there is one main cyst.

Should there be many of equal size they are usually very tense, and such a condition may be wrongly diagnosed as *fibromyomata* of the uterus, owing to the apparent, or perhaps real, attachment of the uterus to the tumour, and to the irregular and nodular surface produced by the small, tense cysts. Even if the practitioner come to the conclusion that the tumour is cystic in parts he is still confronted with the possibility of 'cystic' (oedematous) degeneration in a fibromyomatous uterus. The previous history may help, in that the symptoms may be of short duration, and that there has been no menorrhagia of long standing such as is usually associated with fibromyomata; but in the end careful bimanual palpation alone can decide between the two conditions.

A *broad ligament cyst* nearer the uterus, such as arises from Gartner's duct, nearly always displaces the uterus to one side, and does not fill Douglas' pouch in the way that other cysts do, so that these should not cause any difficulty in diagnosis. There are, however, one or two other conditions which may give rise to difficulty.

Pelvic peritonitis, with extensive serous effusion round an inflamed tube or vermiform appendix, is often most puzzling. In these circum-

stances palpation is of little assistance, but the history of the case is of great value. Serous effusions appear rapidly, and there is a recent history indicative of an acute inflammatory lesion.

Extrauterine gestation with abortion and effusion of blood presents few difficulties when the occurrence is recent, owing to the definite history usually obtained with these cases. Besides, the presence of blood in Douglas' pouch never resembles a cyst, for the consistence of the two is quite different, the blood being free and under no pressure. The pouch of Douglas, also, is uniformly and completely filled by fluid blood, whereas a cystic swelling has not the same uniformity. When the ectopic pregnancy is advanced, or its abortion of old standing (in which case a thick adventitious cyst wall is formed) considerable difficulty may be experienced in making a differential diagnosis unless a satisfactory history be forthcoming.

We shall later have to consider the question of cysts in which changes have taken place, for the present we are only considering cysts in which no unusual changes have occurred.

When the tumour is abdominal in position.—The diagnosis in these circumstances is somewhat easier. On inspection the abdominal wall is seen to protrude over any moderate sized and more or less regular cystic tumour. Sometimes small round nodules, which are the daughter cysts, can be felt in the wall of the main cyst, through which a fluid thrill may be obtained. On percussion there is dulness over that portion of the growth which is in contact with the abdominal wall. It is, however, necessary to make a differential diagnosis between these growths and several other conditions which are somewhat similar in regard to the physical signs.

Free ascitic fluid.—There is not much likelihood of error in regard to this when the quantity of free fluid is small, for with the patient in the recumbent position there is dulness in the flanks and resonance in front, together with flatness of the anterior abdominal wall. The signs are, in fact, exactly the opposite in the case of a large ovarian cyst, in connexion with which we find dulness and bulging of the anterior wall and resonance in the flanks (figs. 89, 90, 91 and 92, pp. 105 and 106).

In the case of free fluid, also, the dulness shifts on turning the patient over to one side, and on sitting her up the fluid collects in the lower half of the abdomen. With an ovarian tumour the dulness never alters in position to any material extent. There may be a fluid thrill in either case. Ordinary precautions to exclude the diseases upon which ascites is dependent must, of course, be adopted in difficult cases.

The method of examination by mensuration described in Chapter IV. may be found useful in distinguishing between an ovarian cyst and ascites. With ascites the greatest circumference

is at the level of the umbilicus; with a cyst of moderate or large size it is below this level. Again, the distance from each iliac spine to the umbilicus is the same with free fluid; with an ovarian cyst the two measurements are unequal.

Localized peritonitic effusion, such as occurs in connexion with appendicitis or tuberculous peritonitis, is a common source of error.

In these cases one finds a cystic collection of fluid which at times may be extremely difficult to distinguish from an ovarian cyst. In these circumstances the history is most valuable.

In appendicitis the effusion appears rapidly with much pain. When the effusion is tuberculous one can frequently feel elsewhere the hard masses of tuberculous deposits in the omentum or glands, and the patient gives a history of abdominal pain extending over a long period. In acute tuberculous peritonitis with ascites the fluid is generally free, and the formation rapid.

Kidney tumours.—A large hydronephrosis may easily give rise to difficulty in diagnosis, especially when the tumour is low down on one side or the other. In these cases valuable evidence may be obtained by utilizing the method of Luys for collecting the urine from each kidney separately. None passes into the bladder from the affected organ in cases of hydronephrosis. Again, with kidney disease there is often a history of long standing trouble in connexion with that organ.

Hypernephromata of the kidney may also give rise to difficulty. These tumours are not so rare as used to be thought. The author has himself removed two specimens from the false pelvis. They may occur at any age and are frequently malignant. In structure they are very soft, much broken down material being contained in the thin walled capsule. They convey the same impression to one's sense of touch as a dermoid cyst or an adenomatous cyst with very viscid contents. The separation of the urine is not always a guide in these cases, for part of the kidney is usually normal and secretes urine. Often, too, there is no haematuria.

Unless fixed by adhesions these tumours tend to fall into the upper abdomen when the patient is examined in the Trendelenburg position. On percussion it will be found that there is bowel between the tumour and the parietes.

Mesenteric cysts may give rise to considerable difficulty, but bowel is almost always found between them and the abdominal wall—a state of affairs which gives rise to a resonant note on percussion over them. They are, too, very uncommon.

Fibrocystic tumours of the uterus are rarely of such a size as to simulate an ovarian cyst; when large, a careful bimanual examination reveals the connexion with the uterus, and the cystic portion will be

felt to merge in the surrounding, hard, fibromyomatous growth; often, too, other fibromyomata can be felt in different parts of the organ.

Distension of the bladder.—This should never be mistaken for an ovarian tumour with ordinary care, but in one case an experienced operator opened the abdomen and found a bladder containing *six pints* of urine instead of the expected cyst, being misled by the fact that two pints had already been drawn off!

The passage of a catheter is advisable in all cases of cystic tumour lying in front of the uterus.

Parovarian retention cysts are at times indistinguishable from ovarian cysts. They occur most frequently, however, between the ages of twenty and thirty years. They are very thin-walled and unilocular, and give a very sharp fluid thrill.

Urachal cysts are very rare, and it is doubtful whether a correct diagnosis can always be made in regard to them. These cysts are usually asymmetrical and extraperitoneal. It may be possible to make out that the genital organs are free of the growth, and to feel both ovaries.

Phantom tumours, pregnancy, distended gall bladder, pancreatic cysts, hydatid cysts, and possibly many other conditions have given rise to mistaken diagnoses in regard to ovarian cysts situated within the abdomen, but hardly need further comment here. An examination of difficult cases under an anaesthetic, and a consideration of the history should clear the matter up in the majority of instances.

Whenever the differential diagnosis of an abdominal cyst has to be made, important information may be obtained by careful bimanual examination. The tumour may be found to be quite free from any pelvic attachment; and the Trendelenburg position is often of great assistance in elucidating this point. Further, the ovaries may be distinctly palpable, indicating that the tumour is not ovarian in origin.

When the tumour is pelvic and abdominal.—In these cases the diagnosis is usually easy, for we know that the lesion is probably associated with the genital organs. The conditions likely to give rise to difficulty are *ectopic gestation* with haematocele of old standing, *tuberculous salpingitis* and *peritonitis with effusion.* These questions have been discussed already, and therefore need not be further considered.

Papillomatous cysts of the ovary (cysts of the hilum).—Since these cysts arise from the hilum of the ovary it is supposed that they originate from Wolffian relics. They are frequently bilateral, and sometimes tend to invade the broad ligament and are then sessile. The papillary growths arise inside the cyst (fig. 239), and may subsequently break through (fig. 240), becoming implanted on the surrounding

Fig. 237.—Pupillometer in position. (From Roberts' Ophthalmoscopy, Fourth Edition.)

A, Outer end of pupillometer. B, Inner end of pupillometer. C, Eyepiece with lens. D, Tube with lens. E, Tube with lens. F, Eyepiece with lens.

Fig. 238.—Pupillometer in position. (From Roberts' Ophthalmoscopy, Fourth Edition.)

A, Pupillometer. B, Eyepiece. C, Tube with lens. D, Tube with lens.

peritoneum. Microscopically the intracystic growths—which arise as a result of the proliferation of the epithelium lining the cyst wall—are seen to have a delicate stroma, and to be covered usually with a single layer of epithelium (fig. 241). Often they have quite a fern-like appearance.

The single layer of epithelium is not absolutely essential to innocency. In figure 242 is seen a section of a papillomatous ovarian cyst from a young girl. It will be noticed that the epithelium is many-layered; yet the tumour was innocent, for neither the stroma nor cyst wall was invaded.

Before extension through the cyst wall occurs the tumour has all the signs and symptoms of a cystadenoma, so that it may be impossible to make a diagnosis between these growths and a multilocular ovarian cyst. When the papillomatous growths are not limited by the cyst wall there is usually an extensive effusion of free ascitic fluid, and some fixation of the growth with early pressure symptoms.

Further, one may find the uterus much displaced by a cystic mass which does not seem to rise into the abdomen in the same way as a multilocular ovarian cyst, in spite of the fact that it is not impacted. On abdominal percussion there may be resonance over the tumour.

Lutein cysts.—While these are of little importance in themselves from a clinical point of view they have some pathological interest; for it has recently been shown that they are frequently associated with hydatidiform moles and chorionepithelioma (deciduoma malignum). The cysts usually have a dull, yellowish colouration, or they may be magenta or red from effusion of blood, but sometimes they resemble ordinary small ovarian cysts. They arise either as the result of an effusion of fluid within the corpora lutea, or of a cystic degeneration of the lutein cells (fig. 243). There is usually hyperplasia of the lutein tissue. As a rule there are several of these cysts in each ovary, the condition being usually bilateral.

Cystic teratomata (dermoid cysts).—From the earliest times a good deal of sentiment and no little curiosity have surrounded dermoid cysts, and have no doubt led to the many admirable and detailed descriptions to be found in text-books. Only a short account of the essential facts will be given here.

These cysts are said to occur in about 3 per cent. of all cases of ovarian cysts. Their mode of origin has never been definitely discovered, although it is assumed that they arise parthenogenetically; that is to say, they are due to the development of an unfertilized sex-cell. This is quite conceivable when we realize that every ovum contains the potential factors for the formation of all the tissues of the body.

Fig. 241.—Intracystic papillomata in an ovarian cystadenoma. ×75. (*Photomicrograph.*)

S. Loose connective tissue stroma. *E.* High columnar epithelium covering papillary growths.

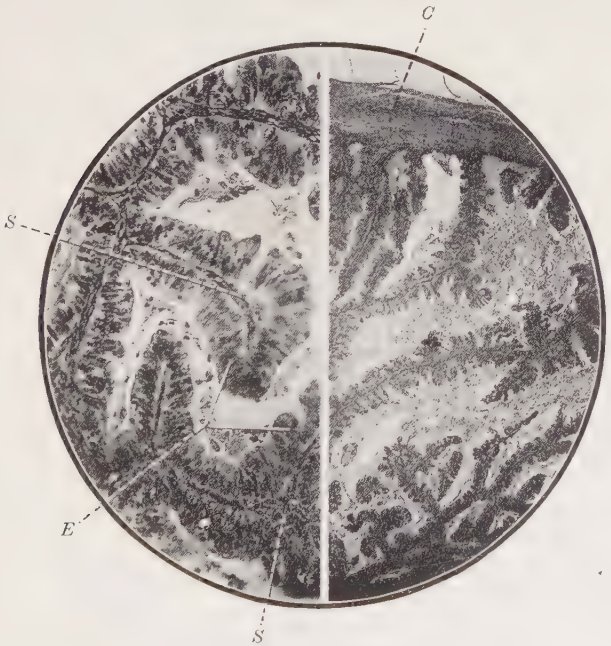


Fig. 242.—On the right hand side is seen a low power (×20) and on the left a high power view (×220) of a section from an innocent papillomatous ovarian tumour in a young girl.

C. Cyst wall. *S.* Stroma of papillary outgrowth. *E.* Columnar epithelium covering the surfaces of papillary growths. It will be seen that this epithelium is many layered, but that it shows no invasion of the stroma nor of the cyst wall.

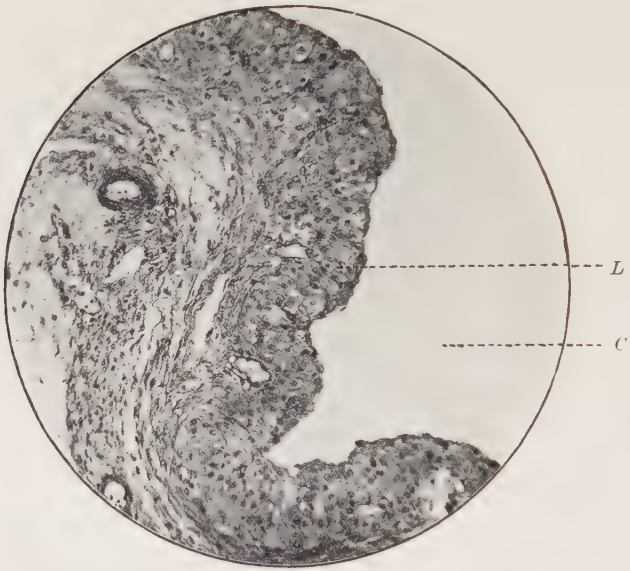


Fig. 243.—Wall of lutein cyst. The section shows the layer of lutein cells (*L*) lining the cavity of the cyst (*C*). ×150. (*Photomicrograph.*)

Dermoid cysts are slow growing, but may attain to considerable dimensions. The cyst wall is thick and fibrous, and is lined with stratified epithelium (fig. 244). In the older specimens the epithelium

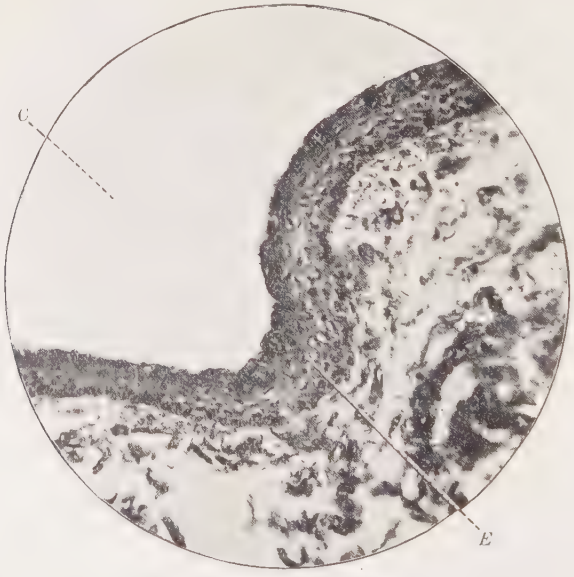


Fig. 244.—Wall of dermoid cyst, showing the stratified epithelium (*E*) lining the cyst cavity (*C*). ×300. (*Photomicrograph.*)

can be recognized only with difficulty. Ovarian tissue is usually to be found in the cyst wall.

The contents of the cyst are composed for the most part of sebaceous material, which is fluid at the body temperature but rapidly sets on cooling; hair also is very commonly found mixed with the sebaceous secretion (fig. 245). Frequently, too, villous outgrowths from the cyst wall are to be seen. On section these are found to be covered with squamous or columnar epithelium and to contain hair follicles,

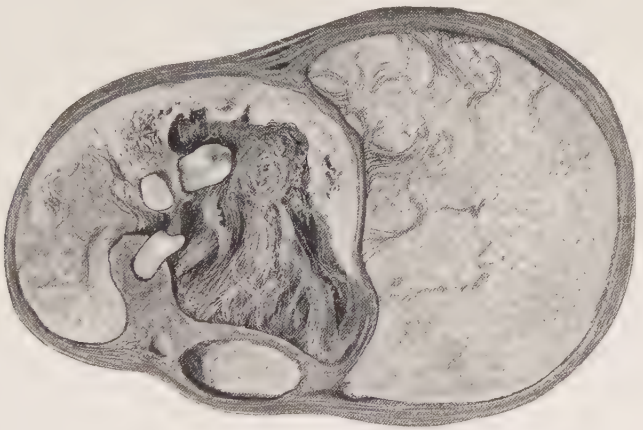


Fig. 245.—Multilocular cystic teratoma (dermoid). The specimen is cut through and shows various loculi containing sebaceous material, hair, teeth and bone.

sebaceous glands and even mucous glands (figs. 246 and 247). In addition, skin, nipple-like bodies, teeth, bone, nail, unstriped muscle and nervous elements are occasionally met with. As a rule the cyst is unilocular, but this is not always the case.

The **symptoms** and **diagnosis** may resemble those of an ordinary ovarian cyst; but in some cases it is possible to form a correct opinion as to their nature owing to the semisolid consistence of the contents, which can be made out by the examining fingers. They are, too, much more movable as a rule than ordinary ovarian cysts. Since they grow slowly and are heavy these tumours often fall into the pelvis and at times give rise to difficulty in parturition.

Complications of ovarian cysts.

Torsion of the pedicle is of very common occurrence in mobile ovarian cysts, and especially in dermoids.

This accident leads to marked changes in the tumour. The rotation is towards the middle line, as in this direction there is

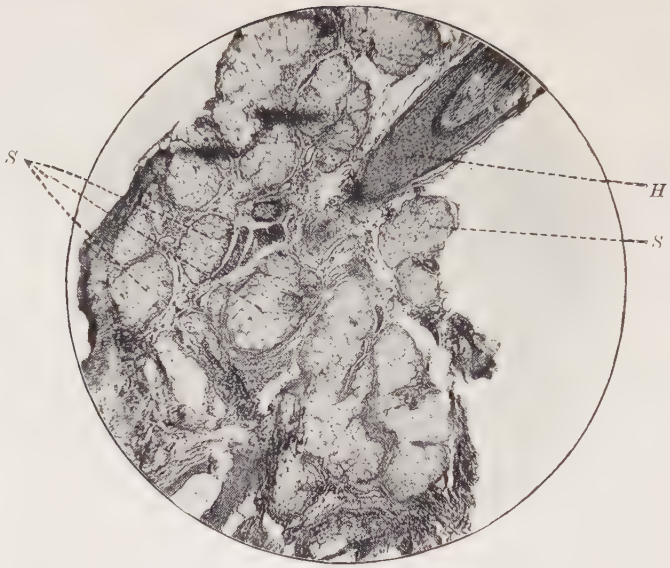


Fig. 246.—Section through an outgrowth in the wall of a dermoid cyst. It is almost entirely composed of sebaceous glands (*S*), but hair follicles (*H*) are to be seen. ×75. (*Photomicrograph.*)

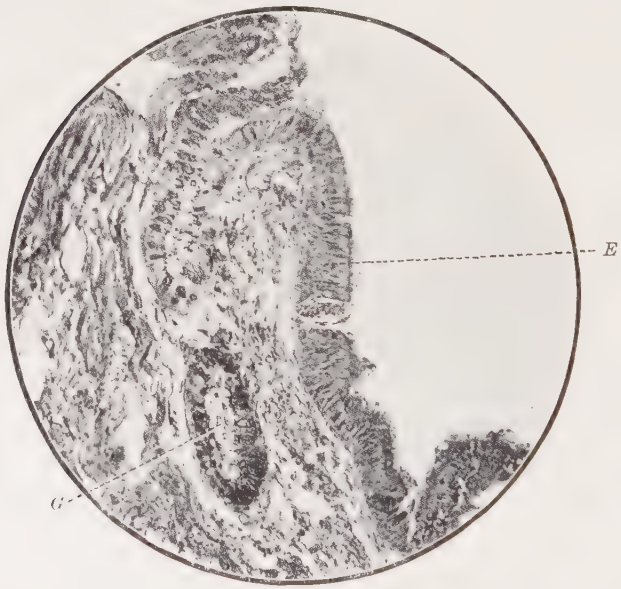


Fig. 247.—High power view of a section of part of a papillary outgrowth in a dermoid cyst. (This is another part of the same outgrowth as that shown in fig. 246.) ×150. (*Photomicrograph.*)

E. Columnar epithelium. *G.* Mucous gland. In the upper part of the section a tubular invagination to form a gland from the surface epithelium is also seen.

less resistance as far as the abdominal parietes are concerned. The torsion may be gradual or sudden. When sudden and complete the blood supply is entirely cut off and gangrene occurs: when torsion is gradual, or partial, it may be that only the venous circulation is interfered with, and in these circumstances the arterial supply leads to haemorrhage into the cyst and rapid distension of it. In a very short time intraperitoneal adhesions are formed; and infection from the bowel may occur subsequently.

The **symptoms** of a twisted pedicle are generally severe and definite. The patient may have been quite well previously in spite of the presence of a 'lump in the stomach'; then suddenly, generally after violent exertion, but sometimes when asleep in bed in the early hours of the morning, she is seized with severe abdominal pain and vomiting, and with all the signs of an acute 'peritonism.' There is a rigid tender abdomen, a rapid pulse and anxious expression. The presence of the tumour makes the diagnosis clear.

When, however, the onset is more gradual and less severe the absolute diagnosis of an ovarian cyst with twisted pedicle is not always so easy. The first point is to diagnose the nature of the tumour, and then to ascribe the correct reason to the pain from which the woman is suffering. If the diagnosis be one of ovarian cyst the cause of the pain lies between this complication and one of the other changes sometimes found in connexion with these tumours, and to be described directly. With a twisted pedicle the onset of pain in a previously painless tumour is more sudden and violent than is the pain associated with other complications; and the sudden increase in the size of the tumour is of great importance.

Infection of an ovarian cyst resulting in suppuration.—This is not an uncommon occurrence, especially after torsion of the pedicle. In pregnancy and in the puerperium, also, there seems to be a greater liability to infection than in ordinary circumstances. A cyst may become infected by the bowel or appendix becoming adherent to its surface; or from tubal infection. In addition to the ordinary pyogenic organisms, including the bacillus coli communis, the typhoid bacillus has been found in suppurating ovarian cysts.

The **symptoms** are a great increase of pain in the tumour and much local reaction on the part of the peritoneum, with the formation of adhesions to the omentum and bowel. The constitutional symptoms vary considerably, but there is always an increase in the pulse rate and a rise in temperature, which may be hectic in character. Sometimes pus escapes from the suppurating cyst into the bowel, and is discharged *per rectum*.

In spite of the statements made to the contrary suppuration rarely

occurs in dermoid cysts. It is probable that the fluid sebaceous material has sometimes been mistaken for pus.

Rupture of an ovarian cyst may be either of a sudden character or take the form of a gradual leakage. In the former case the hole in the cyst wall may be of a moderately large size; sometimes in the latter it can hardly be found.

The sudden rupture of an ovarian cyst is accompanied by pain, by the disappearance of a previously existing tumour and by free fluid in the abdominal cavity. It is said that subsequently there is profuse diuresis, but this certainly does not always occur. The fluid contents of ovarian cysts are irritating, and hydroperitoneum causes a rapid additional increase in the size of the abdomen. The thick ovarian fluid settles in the back of the cavity, with the patient lying in the supine position, while the lighter peritoneal fluid floats in front.

Rupture of an ovarian cyst is not nearly so common as one might suppose. The primary and predisposing factor is degeneration of the cyst wall due to oedema or malignant changes, or possibly in some cases to overdistension or continuous pressure on some part of the wall; undoubtedly trauma is often the determining factor.

Adhesions are brought about by changes in the cyst such as are produced by torsion, infection, or malignant infiltration. Pressure, alone, of a large cyst will also invariably lead to adhesions being formed between the cyst wall and the parietes.

Malignant changes frequently occur in cystadenomata. In fact it is stated by some authorities that of all cases of these cysts removed from women over forty-five years of age 40 per cent. show adeno-carcinomatous invasion of the walls.

The onset and course of malignant infiltration is marked by continuous pain of a not very severe character and by loss of flesh.

Simple papillomatous ovarian cysts and dermoids may also become malignant.

The **treatment of ovarian cysts.**—All ovarian cysts should be removed, and it has lately been urged that whenever possible this should be carried out without tapping the cyst, or in any way disturbing its contents. For if the cyst be papillomatous, or there be infection or malignant invasion of the cyst wall, there is less chance of dissemination if the cyst be removed entire. When the tumour is large it is sometimes necessary to open the abdomen from the ensiform cartilage to the symphysis pubis in order to accomplish its removal entire.

In the case of extensive papillomatous growths it is advisable to remove the primary cysts and any large papillomatous masses from

the pelvis, for it has been found that the peritoneal implantation growths frequently disappear after removal of their source of origin. The primary papillomatous growth is very friable and there may be much bleeding during the removal.

When any complication has arisen in connexion with a cyst there is, of course, the greater urgency for the performance of the necessary operation ; for even when there is adenocarcinomatous disease of the cyst wall the prognosis is not bad if the tumour be removed in good time.

The operative procedures to be adopted are described on page 469.

INNOCENT SOLID TUMOURS OF THE OVARY.—These consist of new growths which are either acquired or arise from congenital inclusions.

Solid new growths of an innocent nature in the ovary are somewhat rare. They are either *myomata*, *fibromyomata*, or *fibromata*, and are therefore probably related. These tumours may give rise to menorrhagia.

Fibromyomata, with a large proportion of fibrous tissue, are the commonest. A section of such a growth is seen in figure 248.

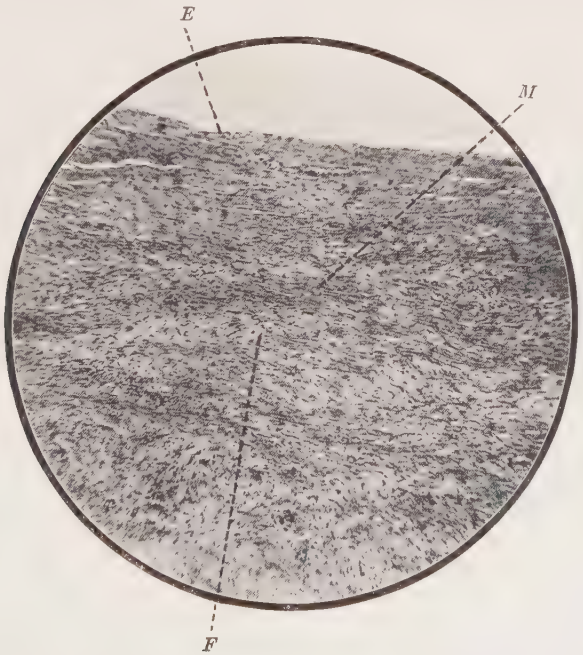


Fig. 248.—Fibromyoma of the ovary. ×100. (*Photomicrograph.*)
M. Muscle fibres. *F.* Fibrous tissue. *E.* Surface of the ovary.

The **symptoms** caused are exactly similar to those produced by a uterine fibromyoma with a long pedicle. They are mechanical, and result from the size of the tumour, which may produce pressure symptoms or interfere with pregnancy. In many cases of fibroma or fibromyoma of the ovary clear ascitic fluid is present in the abdominal cavity. If the venous circulation in the tumour be interfered with one sometimes finds the growth has become oedematous and cystic in parts. One such tumour weighed eleven pounds, and contained a cyst the size of a large cocoanut. The removal is easy, for as a rule extensive adhesions are not formed to the surface of the growth.

Congenital inclusions.—These have occasionally been found in the ovary, forming solid ovarian tumours of an innocent character. On section some are seen to show a structure like that of the adrenal gland, consequently it has been thought that the inclusion dates from the early development of the ovary in the neighbourhood of the kidney. It must, however, be pointed out that the cellular hyperplasia of the lutein layer has been mistaken for a growth of this nature.

In addition to adrenal inclusions tumours composed of tissue resembling the thyroid gland have occasionally been described.

Ovarian tumours and pregnancy.—Ovarian tumours, both cystic and solid, not infrequently complicate pregnancy, labour and the puerperium.

During pregnancy the increased vascularity may cause them to increase in size, and to become tense and painful. There is also a tendency to the occurrence of torsion of the pedicle during the middle period if the tumour be displaced by the enlarging uterus.

Labour may be interfered with by the growth falling into the pelvis and offering an obstruction to the advancing head. This particularly applies to dermoid cysts and solid tumours. Mechanical pressure on a cyst during labour occasionally leads to its rupture.

During the puerperium the growth may become infected; this is especially liable to happen when it has been damaged during the delivery of the child.

Treatment.—Any ovarian tumour discovered during pregnancy, unless it be a very small cyst, should be immediately excised. Pregnancy—at any rate after the first few weeks of gestation—is almost certain to proceed uninterruptedly even if both ovaries be affected and removed.

Many cysts cause no impediment during labour, and consequently need not be dealt with until later. Should the tumour fall into the pelvis it is often possible, with the patient under an anaesthetic, to push

it up past the foetal head into the abdominal cavity. If this be impossible the abdomen should be opened, the growth removed and the labour allowed to terminate naturally: in some cases Caesarean section might be performed. If the cyst rupture during labour it must be removed a few days after delivery, unless the symptoms be urgent.

Complications during the puerperium must be dealt with according to the lines already laid down.

CHAPTER XIII.

MALIGNANT NEOPLASMS OF THE GENITAL TRACT.

MALIGNANT growths of the genital tract consist of the various forms of *carcinoma* and *sarcoma*. They will be discussed in detail according to the portion of the tract in which they originate.

§ i. MALIGNANT DISEASES OF THE VULVA.

The following varieties of malignant disease of the vulva may be met with:

(1) Carcinoma,
Squamous-celled or columnar-celled.

(2) Sarcoma,
Melanotic, round-, spindle- or mixed-celled.

CARCINOMA OF THE VULVA.—Certain forms of this disease are not uncommon.

Squamous-celled carcinoma (epithelioma) arises from the clitoris, labia majora, urethra and labia minora, in that respective order of frequency. When early removal is undertaken the prognosis is distinctly favourable.

Epithelioma of the clitoris is seen as an ulcerating and exuberant mass, which often has a definite base at the attachment of the clitoris (fig. 249). A microscopical section of an epithelioma of the clitoris is seen in figure 250. The patients usually complain of some pain, great irritation, a foul discharge and bleeding. If the case be at all advanced the glands in the groin are enlarged. The patients are generally old multiparae.

Fig. 249.—Fungating epithelioma of the clitoris.

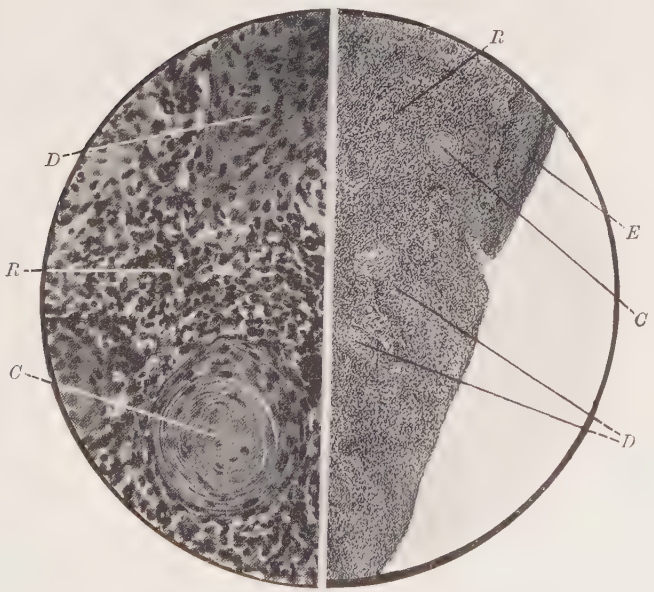


Fig. 250.—Epithelioma of the clitoris. To the right is a low power (×75) and to the left a high power (×400) view of the same section. (*Photomicrograph.*)

E. Normal epithelium on the surface. *R.* Round cell infiltration. *D.* Malignant downgrowths of epithelial cells. *C.* Cell-nests.

Epithelioma of the labia majora usually takes the form of an excavated ulcer with hard everted edges. It is not uncommon to see symmetrical growths (fig. 251). The smaller is caused by implantations from the larger. The disease tends to spread outwards. The glands in the groin are involved in advanced cases.

Fig. 251.—Ulcerating epithelioma of the labium majus of the left side with a contact growth on the right labium majus.

Figure 252 is a section of an early carcinoma of the vulva; it shows the transition from the normal epithelial surface to the malignant invasion of the subjacent tissues.

Epitheliomata of the labia minora and urethra are very rare. The characteristics of the disease are very similar to those presented by cancer of the clitoris.

Columnar-celled carcinoma of the vulva (adenocarcinoma) always originates in the glands of Bartholin. This is a very rare affection. In the early stages a hard, infiltrating growth can be felt in the lower part of the labium majus of the affected side. Later in the disease the skin is invaded, and eventually there is a large fungating mass.

SARCOMA OF THE VULVA.—This is not often met with; the commonest variety is the so-called '*melanotic sarcoma*.'

Malignant melanoma ('melanotic sarcoma') may occur on any part of the vulva. Most commonly the disease arises in the labium majus where it forms a small bluish-black mass. The growth rapidly increases in size and may break down, leaving a bleeding and ulcerating surface. Sometimes quite a large tumour is formed without superficial ulceration (fig. 253). The age of the patients varies very much, but this disease occurs in somewhat younger women than ordinary carcinoma of the vulva. There has been a good deal of discussion as to whether these growths, through which the pigment may

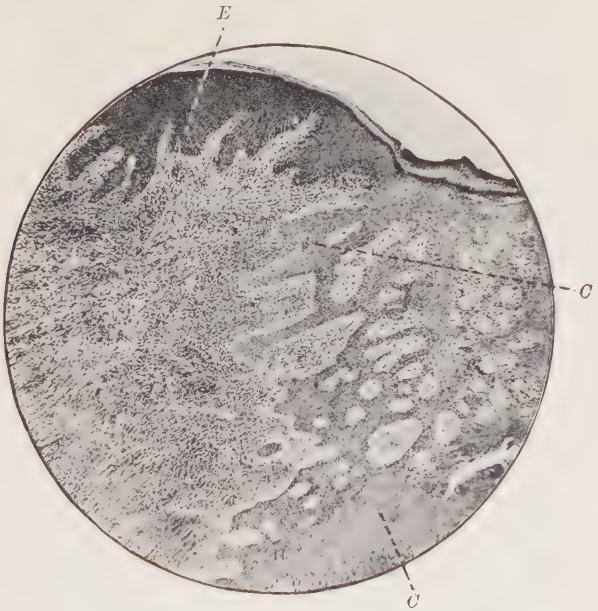


Fig. 252.—Carcinoma of the vulva. The normal surface epithelium is seen at *E*, to the right of this are extensive epithelial downgrowths (*C*). In the subepithelial tissues in the left half of the picture there is an extensive round cell infiltration. ×75. (*Photomicrograph.*)

be seen irregularly scattered, be carcinomatous or sarcomatous; and the matter has not yet been conclusively decided. It is better, therefore, to call them 'malignant melanomata.'

The glands in the groin are invaded early, and the disease is extremely rapid and fatal in its course.

Pure sarcomata are of extreme rarity. They may be either round-celled, spindle-celled, mixed-celled or myxomatous. The latter two varieties have been most frequently described. The labium majus

is the commonest site of origin. These forms of sarcoma do not involve the glands so early as the malignant melanomata, nor are they so malignant. A case of spindle cell sarcoma of the labium minus (figs. 254 and 255) was alive and well when last heard of, three years after the growth had been removed.

Fig. 253.—Melanoma of the vulva. (*Eardley Holland.*)

The **diagnosis** of malignant growths of the vulva is not difficult. It may, however, be quite impossible to distinguish, except by the aid of the microscope, between pure sarcoma and carcinoma, especially when the disease is of the exuberant and fungating type, as will be seen from the illustrations already given (figs. 249 and 254).

Occasionally tuberculous (see p. 275) and syphilitic ulcerations (see p. 259) have to be distinguished from malignant ulcers. A primary chancre is nearly always associated with oedema of the labia, and has a smooth shiny surface; the edges also are not so heaped up

Fig. 254.—Spindle cell sarcoma of the vulva.

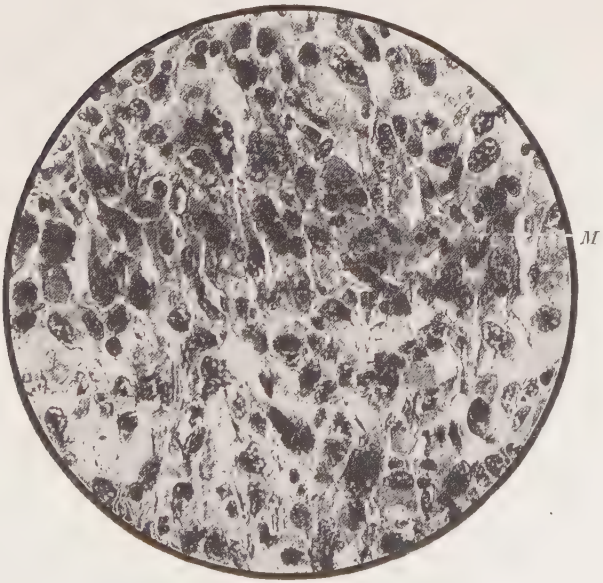


Fig. 255.—Spindle cell sarcoma of the vulva. At *M* a mitotic figure may be seen. ×300. (*Photomicrograph.*)

as those of a malignant ulcer. Tuberculous ulcers are usually undermined and present an eaten-out appearance. At times, however, the physical appearances of both syphilitic and tuberculous ulcers are not typical and may cause some difficulty in the diagnosis, but this can always be got over by histological and bacteriological examinations.

The **treatment** of all malignant growths seen early enough is free excision of the tumour together with the inguinal glands of one or both sides (see p. 476).

§ ii. MALIGNANT DISEASES OF THE VAGINA.

These are carcinoma, sarcoma, and chorionepithelioma. All these usually occur as growths *secondary* to a similar condition in the uterus. They may, however, occur as primary growths in the vagina; and it is only with these, therefore, that we are concerned in this section.

CARCINOMA OF THE VAGINA.—This is a commoner condition than has usually been thought. The disease is most often situated high up on the posterior wall. The patients are said to be of a higher average age than is the case with carcinoma of the cervix. The growth is of the squamous-celled variety. There may be some pain on defaecation and coitus, and there is generally a profuse, foul, and watery discharge which in advanced cases becomes sanguineous. The disease takes the form of an ulcerated surface with a raised and everted edge. It tends to spread somewhat slowly; this may be due to the age of the patient, for it is well known that cancer grows more rapidly in young subjects than in old.

In those cases in which the disease is situated in the upper part of the vagina the pelvic glands are infected early. When the growth is situated in the lower part of the vagina (if this be derived from the urogenital sinus, as is usually the case) the glands in the inguinal region may be involved.

The **treatment** consists of the removal of the whole vagina and uterus (see p. 491).

SARCOMA OF THE VAGINA is rare as a primary disease, but occasionally occurs in children and young adults. The passage is found to be filled with a grape-like mass which may even protrude through the vulva (fig. 256). This form of sarcoma is polypoid in its attachment, and rapidly breaks down.

Histologically examined these growths are found to be mixed-celled in structure and extremely oedematous and haemorrhagic. The prognosis is very bad, and the growth generally quickly reappears after removal. In adults circumscribed sarcomata may be seen, and in these cases the histological structure is most commonly found to be of the spindle-celled variety. Cases of pure round-celled sarcomatous growths, which formed nodular 'lumps' in the vaginal wall, have also been described. These types of growth are not so malignant, if dealt with early, as the form found in children.

Treatment.—Removal of the vagina and uterus is the only method likely to be of the slightest use, at the present time.

Fig. 256.—Mixed cell sarcoma of vagina forming a polypoid growth. (*E. J. Maclean.*)

CHORIONEPITHELIOMA OF THE VAGINA is rare; but after the uterus the vagina is the commonest site for primary growths.

§ iii. MALIGNANT DISEASES OF THE UTERUS.

In discussing malignant diseases of the uterus it is best to divide the subject into growths of the *cervix* and those of the *body*.

MALIGNANT DISEASES OF THE CERVIX.—The following varieties may be met with:

(1) Squamous-celled carcinoma.
(2) Adenocarcinoma.
(3) Sarcoma.

SQUAMOUS-CELLED CARCINOMA (epithelioma).—This form of disease most often occurs in child-bearing women before or about the time of the menopause.

The growth arises in the deeper layers of the stratified epithelium covering the vaginal surface of the cervix.

Clinically, the growth first shows itself as a small nodule (epithelial) which soon breaks down and ulcerates.

The disease may spread on to the vagina, and form an extensive nodular and ulcerating growth (fig. 257); more rarely a deeply eroding ulcer is seen. Sometimes the growth assumes the well-known cauliflower-like shape, arising from either lip of the cervix, and in

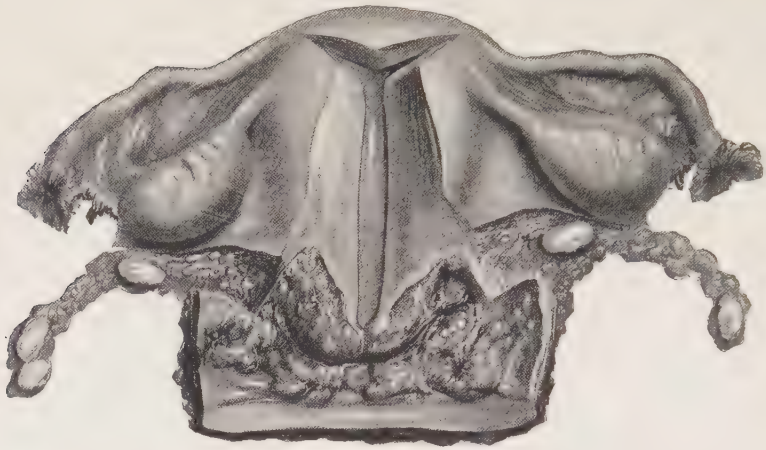


Fig. 257.—Ulcerating squamous cell carcinoma of the cervix; there is extension on to the vagina. The specimen illustrated was removed with the fat and glands by Wertheim's method of pelvic dissection.

this case the energy of growth seems to be expended in the production of a large tumour rather than by the invasion of the neighbouring structures (fig. 258).

Fig. 258.—Carcinoma ('cauliflower' growth) of the anterior lip of the cervix.

Pathology.—Microscopically large masses of epithelial cells are seen, not only on the surface, but forming downgrowths and islets in the subepithelial tissues (figs. 259 A and B). Cell nests, such as are seen in cutaneous epitheliomata, are practically never seen in cancer of the cervix. There is, however, a tendency for the squamous epithelium to undergo metaplasia and to take on a columnar-celled type with gland formation. There is always extensive round cell infiltration encircling the growth. In those cases in which there is an exuberant 'cauliflower' growth there is, as already indicated, much less invasion of the deeper structures by the epithelial cells than in the ulcerating type. This is a point of great practical importance when one is considering the advisability of operative procedures.

Symptoms, physical signs and **diagnosis.**—In these forms of growth there is a great deal of foul, watery discharge, which is sometimes bloodstained. As the disease advances there is loss of flesh and cachexia, and in the latest stages there may be considerable pain. The various late complications of cancer will be discussed presently. On inserting a vaginal speculum and cleaning out the vagina we are able to see the condition of the cervix. If the growth be large and exuberant we can only see in the vagina a foul, ulcerating mass, that bleeds easily (fig. 258). If the growth be not of the 'cauliflower' type we may see a large ulcer with hard everted edges and friable nodular base occupying the vaginal vault in proportion to its size, and in advanced cases extending on to the walls of the vagina (fig. 257). In other cases the ulcer is seen to be deep and eroding.

If we examine the patient bimanually with the gloved hand we find that in the first case, where the growth is exuberant, we can get our fingers all round it; and it is possible to make out that the tumour springs from one or other lip of the cervix. On examining further we may find that there is some fixation of the uterus—that it is not freely movable; or, on the other hand, we may find no appreciable immobility or thickening of the vaginal fornices. We have now to make a definite diagnosis, and the only difficulty that could possibly arise, when the growth is of the exuberant type, is between carcinoma and an innocent tumour (fibromyoma) that is breaking down. If we consider what it is that causes sloughing of fibromyomata in the vagina we will readily be able to decide that that factor—strangulation of the pedicle—does not exist in the case of a cauliflower-like carcinoma; for we can trace the site of origin to the external surface of the cervix, and not to the interior of the cervical canal, through which the pedicle of a sloughing fibromyoma passes surrounded by the lips of the cervix. Further, a carcinomatous growth is extremely friable—far more so than

Fig. 259 A.—Low power view of an epithelioma of the cervix, seen near the edge of the growth. ×75. (*Photomicrograph.*)

N. Necrotic epithelium overlying the growth. A little way to the right (not seen in this field) the surface epithelium is normal. *E*. Large masses of epithelial cells dipping deeply down into the cervix.

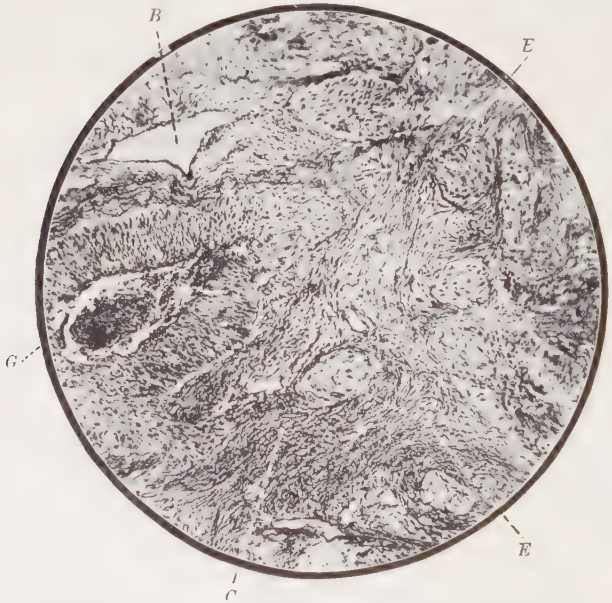


Fig. 259 B.—Epithelioma of the cervix uteri. Masses of squamous epithelial cells (*E*) are seen to be invading the connective tissue (*C*). In one place (*G*) there is an attempt at gland formation; this is not uncommon in epithelioma of the cervix. *B*. Blood vessel. ×150. (*Photomicrograph.*)

a sloughing fibromyoma. A microscopical examination of a piece of the diseased tissue, excised for the purpose, will set any possible doubt at rest.

If, however, on vaginal inspection we see an extensively ulcerated surface, instead of an exuberant growth, we will find on palpation that the edges are very hard and raised. If the growth be of the eroding type, and at all advanced, the cervix may have disappeared. In the very early cases the uterus will be found to be quite mobile and the fornices soft and elastic, indicating that extension of the growth to the broad ligaments has not occurred. Later in the disease we find that the uterus is fixed and immovable, and the fornices hard and resistant owing to the invasion of the cellular tissue of the broad ligament by the malignant disease.

It is hardly necessary, in the present day, to urge the *extreme importance of early diagnosis* in all cases of malignant disease, if a cure is to be effected. The rapidly growing and exuberant tumour with the very profuse and foul watery discharge is not often mistakable. It is the small, ulcerating growth that gets beyond treatment before it is recognized; and this is often because the woman herself has so few symptoms—the discharge may not be very profuse, and there may be no pain in the early stages. The presence of foul or blood-stained discharge should always raise the gravest suspicions in the mind of the practitioner when it occurs in a woman after the age of forty. Since many cases occur before the menopause in comparatively young women—who attach little importance to a slight irregular haemorrhage or bloodstained discharge—it follows that only the careful and thorough examination of every gynaecological patient who presents herself will enable us to get these cases early. Many of the early detected cases are discovered almost by accident. For instance, a woman aged 36 presented herself in the out-patient room. She came complaining of haemorrhage following a miscarriage six weeks before. Examination revealed a very early carcinomatous ulcer of the posterior lip of the cervix from which there was no haemorrhage and very little discharge—the bleeding being due to a placental polyp. Vaginal hysterectomy was performed. The specimen removed is shown in figure 260. Any ulceration of the cervix should, then, be carefully investigated, and, unless the diagnosis of carcinoma be clear, a piece should be excised for histological examination.

Early ulcerating carcinoma of the cervix is sometimes mistaken for an '*erosion.*' An 'erosion,' however, if gently examined does not bleed so readily; it has a clean red surface and is soft and velvety to the touch.

Eversion (ectropion) can hardly be mistaken for carcinoma for the

surface is clean and the everted cervical *rugae* can be seen. This condition is, however, usually associated with laceration of the cervix, with which chronic cervicitis and a certain amount of thickening of the broad ligament—the result of a previous infection—may be found. It must be remembered that carcinoma almost always commences in a cervix that has been injured, consequently all lacerated cervices must be carefully examined and the possibility of the existence of an early carcinoma borne in mind.

Fig. 260.—Uterus with a small epithelioma of the cervix (*C*), and containing a placental polyp (*P*).

Syphilitic ulceration of the cervix might give considerable difficulty. But we must bear in mind the extreme rarity of this condition, at any rate in so far as the patients present themselves for treatment. In syphilitic ulceration the surface is less friable and hard, and does not bleed so readily as in the case of malignant disease; so that if the ulcer be small and other definite symptoms of syphilitic infection exist, a few weeks' treatment with anti-syphilitic remedies may be justifiable—but the case must not be lost sight of. It must also be remembered that syphilitic lesions may become malignant, so that it is most important to remove a piece of the ulcerated surface for examination in those cases in which the ulceration does not rapidly disappear under treatment.

Tuberculous ulceration may also give rise to considerable difficulty which the microscope alone can remove. As a rule, however, there is

tuberculous disease elsewhere, for this condition is rarely primary in the vagina or on the cervix. Tuberculous ulceration may be extensive without producing the same extent of local invasion in the surrounding cellular tissue as carcinoma. The surface of the ulcer may resemble very closely the carcinomatous ulcer, but the edges are not so hard and they are usually undermined.

ADENOCARCINOMA OF THE CERVIX.—This occurs in exactly the same type of patient as the squamous-celled variety—the multiparous woman towards the end of her active sexual life. The disease arises from the glands in the cervix (fig. 261), it is said sometimes to

Fig. 261.—Adenocarcinoma of the cervix uteri. Masses of columnar epithelial cells (*E*) are seen to be taking on a glandular formation, the cavity of a large gland being seen at *G*. The individual glands are not separated by connective tissue, although large groups of them are. ×150. (*Photomicrograph.*)

arise from the epithelial lining of the cervical canal. This form of carcinoma is very malignant and rapidly erodes the cervix, until in a short time it is converted into an excavated cavity (fig. 262). The disease quickly extends to the cellular tissue. The invasion of the broad ligaments is sometimes difficult to detect before operation, owing to the comparative softness of the early invaded tissues. Only very rarely does the growth spread on to the vaginal walls.

The **symptoms** are not so noticeable as in the case of an exuberant epithelioma, for the discharge is less. In these circumstances it is usual to find the disease well advanced, and the cervix replaced by a deep excavated cavity, before the patient has had any symptoms—

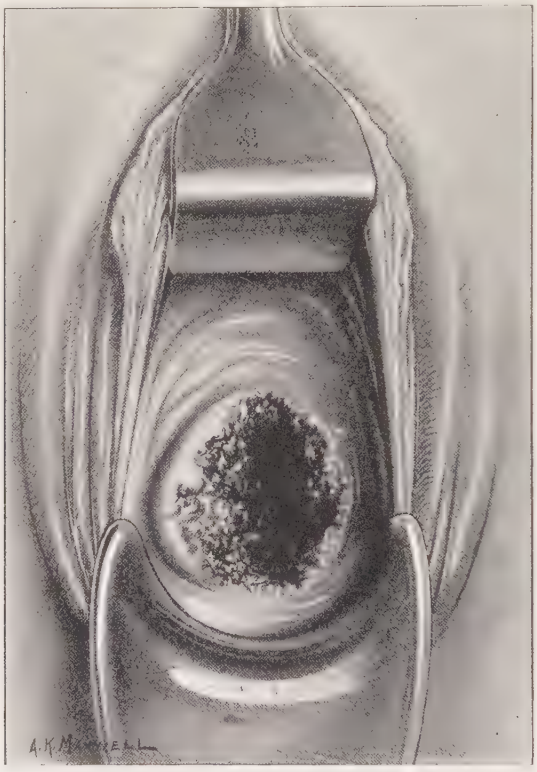


Fig. 262.—Adenocarcinoma of the cervix. The left side of the cervix is completely destroyed, but on the right side a rim still remains.

generally a haemorrhage—of sufficient importance to attract her attention.

If the patient be examined bimanually, in an advanced case a deep funnel shaped hole will be felt at the summit of the vagina. The surface of this excavation bleeds very easily. There is no other disease an advanced case of this type can possibly be mistaken for. Cases are occasionally seen in which the growth has commenced some distance up the cervical canal, so that it may be well advanced, and even extend into the broad ligaments without the vaginal cervix showing any signs of disease. In these circumstances, however, there is always bleeding.

If the disease were very early—before any ulceration had occurred—a small growth might be detected, protruding from the cervical canal. It would be impossible to make certain of the nature of the disease at this early stage unless a piece were excised and submitted to histological examination. The malignancy of the tumour would be seen in the remarkable proliferation of the glands and of the epithelial cells lining them.

The progress and complications of carcinoma of the cervix.

Whether the disease be of an epitheliomatous or adenocarcinomatous nature the steady progress towards a fatal issue, unless the disease be recognized and treated very early, is much the same; so we can discuss the two types together here in respect to their progress and complications.

Invasion of neighbouring structures.—All cases of carcinoma of the cervix soon invade the surrounding structures, and spread to the cellular tissue and lymphatics of the broad ligament and thence to the pelvic and lumbar glands. Those cases which ulcerate early and erode spread more rapidly than the exuberant and proliferating variety. During the progress of the disease the surrounding structures, apart from the lymphatics, may become involved. The part most commonly affected first is the *bladder*, the involvement of which gives rise to cystitis with symptoms of vesical irritability, frequency of micturition, and pain after the urine has been voided. As the disease progresses the vesico-vaginal or utero-vesical walls may be eroded and perforated, and a vesical fistula formed. This is a most distressing complication, for added to the foul discharge and pain is the discomfort of the continual dribble of urine. In the same way the *rectum* may be involved, tenderness and pain on defaecation, with the passage of blood, being prominent symptoms; eventually a recto-vaginal fistula may be formed.

Intestinal obstruction due to constriction of the rectum by the growth is not uncommonly seen in the later stages of the disease. In such circumstances it may be necessary to perform colostomy in order to give temporary relief.

The *ureters* are said to show a peculiar resistance to the actual invasion of malignant disease; and during hysterectomy they are often freed from a mass of cellular tissue involved in the progress of the growth. Sufficient investigations have not yet been made to enable us to say how much reliance may be placed upon such beliefs. At any stages of the disease the ureters may become infiltrated, or—and this is probably more common—they may be constricted by the disease which surrounds them. When this occurs hydronephrosis or pyelonephritis may follow, with all the attendant symptoms of those conditions.

The *peritoneum* is rarely invaded by the growth in such a way as to lead to ulcerative lesions. When the disease spreads towards the peritoneum, as it frequently does in the direction of Douglas' pouch, adhesions are formed and that part of the peritoneal surface becomes obliterated.

Pyometra is an occasional complication of carcinoma of the cervix. In these circumstances the canal becomes blocked and the discharge collects behind the obliteration.

Carcinoma of the cervix with pregnancy.—Sometimes carcinoma of the cervix is complicated by pregnancy (fig. 263). That is to say

Fig. 263.—Carcinoma of the cervix associated with pregnancy.

a patient who is pregnant may develop cancer subsequent to impregnation; or a patient who has an early carcinoma of the cervix may become pregnant; this does not occur very often as the discharge from the growth has a detrimental effect upon the vitality of the spermatozoa. There are several points of interest in the diagnosis and treatment of these cases which require to be considered separately, and this can best be done here.

The diagnosis of cancer may be masked by the fact that the tissues are much softened during pregnancy; this applies to cancer-invaded as well as to normal structures. Consequently the fornices may be soft and the growth itself may not be very hard to the touch. There is, however, the usual discharge and somewhat similar appearance on inspection. In all early, and therefore possibly doubtful,

cases a small piece should be removed for microscopical examination. The progress of the disease during pregnancy is said to be more rapid in spite of appearances; there is greater prospect of dissemination and therefore the prognosis is even worse than in cases uncomplicated by pregnancy. The fact that the women are young (thirty to forty years of age) may have some bearing on this point.

The question of treatment must be looked at from two points of view. Firstly, the safety of the mother is of paramount importance. When the disease does not appear to be far advanced, therefore, and the pregnancy is in the early stages, the uterus must be removed by abdominal hysterectomy, with pelvic dissection, as soon as possible.

Secondly, when the disease is far advanced and the time for operation is passed the pregnancy may be allowed to continue, and the child removed at full term by Caesarean section.

Between these two extremes a certain number of cases falls. The following is an illustration of this. A patient, six and a half months advanced in pregnancy, presented herself with a foul discharge. A carcinoma which had been growing for several months was discovered. The patient was extremely anxious to have a live and healthy child. The question to be faced, therefore, was whether it was justifiable to wait six weeks, knowing how rapidly the disease grows during pregnancy; or whether the uterus and its contents should be removed at once. All that can be said here is that the treatment of these difficult cases must be based on the special conditions and circumstances of each case. If it be decided to wait Caesarean section is first performed, and then extensive hysterectomy carried out. When this course of action has been decided upon care must be taken to wait long enough to insure a thoroughly viable child, as nothing can be more disappointing than for the child to die a week or two later, after additional risk to the mother has been incurred by waiting.

It may be mentioned that the removal of the uterus in these circumstances is comparatively easy owing to the softness of the tissues, provided the haemorrhage be well controlled; but the limits of cellular invasion are very deceptive for the same reason. None the less a wide pelvic dissection should always be carried out.

Termination of carcinoma of the cervix.—Untreated cases of carcinoma all die. Isolated instances here and there have been reported as having recovered; and doubtless this happy result has occasionally occurred, but not often enough to make it worth serious consideration.

As a rule death takes place about a year to a year and a half after the observation by the patient of the first symptoms. No doubt the disease existed some time previously.

As to the most frequent causes of death:

Exhaustion from the prolonged wasting, and from cachexia due to haemolysis, is probably the commonest method of release.

Kidney disease, caused by the constriction of the ureters or septic infection spreading up the ureters from the bladder, is quite a common termination of malignant disease of the cervix. If there be uraemia the condition is sometimes acute, with convulsions and coma; at other times it is manifested by drowsiness and headaches, when a more chronic course is pursued to the fatal issue.

Septic toxaemia is undoubtedly a very powerful causal or auxiliary factor in the ultimate result. Sepsis occurs in all breaking down growths that are exposed to infection; and the foul smell and purulent discharge are sufficient indication of the infected nature of the sloughing tissues in carcinoma of the cervix. The toxins formed are absorbed into the circulation, just as they are from any septic wound.

The patient often has a hectic temperature when she is absorbing these deleterious products. Actual septicaemia is probably very rare.

Thrombosis which is of a septic character leads sometimes to infective emboli, which may kill the patient directly or by giving rise to pyaemic abscesses.

Metastases sometimes prove fatal by affecting vital structures of the body, such as the central nervous system, lungs and liver; but as a rule they occur very late in this disease.

Peritonitis is not at all common and is usually of a chronic nature. Sometimes, however, the sudden giving way of adhesions leads to acute peritonitis and death.

Haemorrhage, although rarely causing death, very materially assists the other factors at work by the serious drainage of the system which results from frequent and severe 'floodings.'

Treatment of carcinoma of the cervix.—In discussing the treatment of most diseases it is advisable, when possible, to pay some attention to *prophylaxis*. Now it is well known that primary carcinoma of the cervix is practically confined to women who have borne children. This is a fact of the greatest moment, for few women escape laceration and subsequent cervicitis as a consequence of their contributions to the perpetuation of the species. Herein lies the most powerful predisposing factor to subsequent carcinoma. This has only to be realized to cause the practitioner to leave no cervix unrepaired nor case of cervicitis untreated.

When a case of carcinoma is brought under notice the first question to be decided is whether a radical cure should be attempted, or whether palliative measures only are possible. There will of course be many

cases which are on the border line, and in these the personal equation of the surgeon will form an important factor in the opinion arrived at. It is impossible, therefore, to discuss such cases, since to one man the operable case percentage is considerably higher than to another; much depends on the surgeon's individual skill, experience and judgement. All, however, are agreed that early cases in which the uterus is movable and in which there has been, at the most, but slight invasion of the neighbouring structures, should be submitted to *operation* without delay. It is well known that in cancer of the cervix metastases occur very much later than in most forms of malignant disease; and this is an additional argument in favour of operation. At the present time an attempt is being made by most operators to effect a scientifically radical procedure in suitable cases. In order to accomplish this complete abdominal hysterectomy is performed, with removal of the tubes and ovaries, and with extensive resection of the cellular tissue and glands of the pelvis (see p. 457). There are, however, still some surgeons who think that they can obtain just as good results by vaginal hysterectomy; but there is no doubt that given sufficient skill and experience the extended abdominal hysterectomy is the proper scientific procedure in all early cases.

In those cases in which the uterus is fixed, and in which the neighbouring structures are extensively involved, *palliative treatment* only is permissible. If there be a large fungating growth in the vagina it should be removed with the patient under an anaesthetic, in order to get rid of much of the foul discharge.

Removal is best accomplished by snipping away the growth with scissors under constant irrigation. When as much as possible has been removed in this way, the base and any outlying portions of the growth should be cauterized with the actual cautery. This is conveniently and easily carried out by means of Paquelin's thermo-cautery (fig. 264). The burnt area is treated with acetone (*v. infra*) and then packed with iodoform gauze.

If the carcinoma be of the eroding type the surface may be carefully curetted and then seared with the cautery—care being taken not to burn through into the rectum or bladder—and the hole plugged with iodoform gauze after treatment with acetone. In this way the parts are cleansed and the growth inhibited for the time being.

Subsequent to this local treatment, which adds greatly to the patient's comfort by lessening the foul discharge, and in some cases relieving the pain, the patient should be douched regularly twice daily with an antiseptic solution; if there be much haemorrhage it will be found that turpentine (℥j emulsified in Oj of water) will prove the most satisfactory.

In most cases great benefit, especially in regard to haemorrhage, is derived from treatment twice a week with acetone, which causes hardening and shrinkage of the diseased tissues. This is accomplished by exposing the diseased area through a metal Fergusson's speculum,

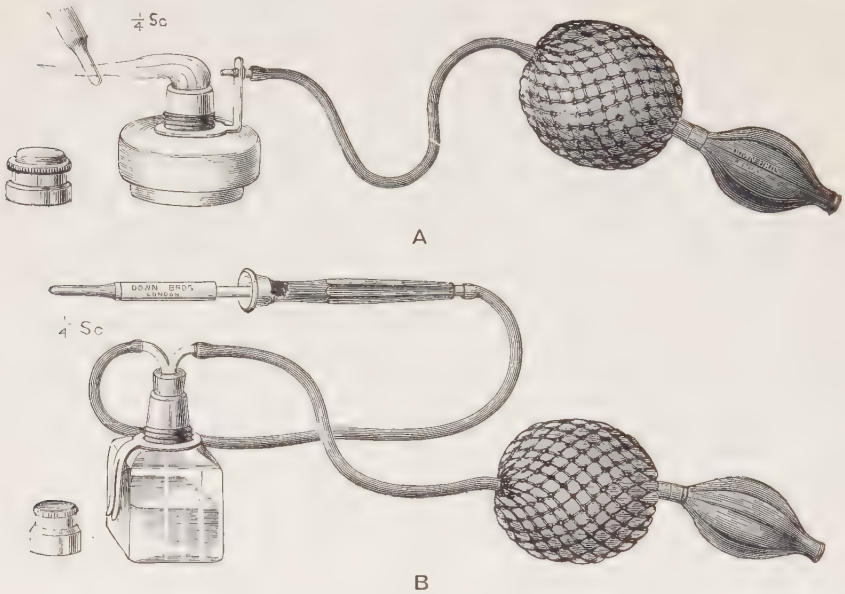


Fig. 264.—Paquelin's thermo-cautery.

A. Preliminary heating of metal cautery.
B. Heat maintained with benzoline vapour.

drying the parts with dabs and then pouring acetone into the speculum. After this chemical has been in contact with the disease for ten minutes it is drained off, the vagina dried and a pack inserted for a few hours. Care must be taken to prevent the acetone coming in contact with any parts other than the diseased area.

When fistulae have formed between the bladder or rectum and the vagina the disease is usually in a very advanced stage, and the patient has not long to live. In these circumstances the careful attention of a capable nurse alone can mitigate her sufferings. The greatest vigilance is necessary to prevent bedsores. All prominent bony points on which there is any pressure should be painted daily with tinctura catechu and liquor plumbi subacetatis in equal parts; this is washed off with spirit before the part is repainted.

Pain can only be relieved satisfactorily with opium. This drug should be resorted to unsparingly in order to keep the patient free from actual pain in the later stages of the disease.

SARCOMA OF THE CERVIX.—This is an extremely rare condition, which usually occurs in young girls. The variety which has most frequently been described is the mixed-celled, which takes the form of a bunch of deep blue coloured grapes, and in which oedema of the stroma is marked. The other forms of sarcoma of the cervix—round-celled and spindle-celled—cannot be distinguished from carcinoma until a microscopical section has been examined.

The **symptoms** consist of foul discharge with haemorrhages, and, later in the disease, pain.

Treatment.—Whenever possible the entire uterus should be removed, but the prognosis is always exceedingly grave.

The complication of pregnancy and sarcoma might be met with; in such circumstances what has been said concerning carcinoma cervicis and pregnancy would have equal applicability.

MALIGNANT DISEASE OF THE BODY OF THE UTERUS.—Squamous-celled carcinoma may spread from the cervix into the body of the uterus by direct extension, but the following are the only varieties of malignant disease that originate in the body of the uterus:

(1) Adenocarcinoma.

(2) Chorionepithelioma.

(3) Sarcoma, including endothelioma and perithelioma.

ADENOCARCINOMA of the body of the uterus is frequently met with, although it is not nearly so common as carcinoma of the cervix. This form of malignant disease is nearly always found in elderly (fifty to sixty years of age) spinsters or nulliparae.

Pathology.—The disease may be diffuse and involve the whole endometrium (fig. 265) or be localized (fig. 266). The growth is very friable and soon breaks down.

On microscopical section (fig. 267) it will be seen that there is a great profusion of glands which are lined with many layers of columnar and atypical epithelium; and that the glands themselves are formed in masses of cells and are not separated from one another by connective tissue. Also it will be found that the glandular formation and growth are not limited to the endometrium but extend deeply into the muscle wall.

The name '*adenoma malignum*' has been given to an atypical form of adenocarcinoma which is clinically malignant, but histologically shows no proliferation of the epithelium of the glands, which nevertheless are found to invade the muscle wall of the uterus. This terminology is to be deprecated not only because it is misleading, but

also because it is likely to confuse important issues in the study of cancerous growths.

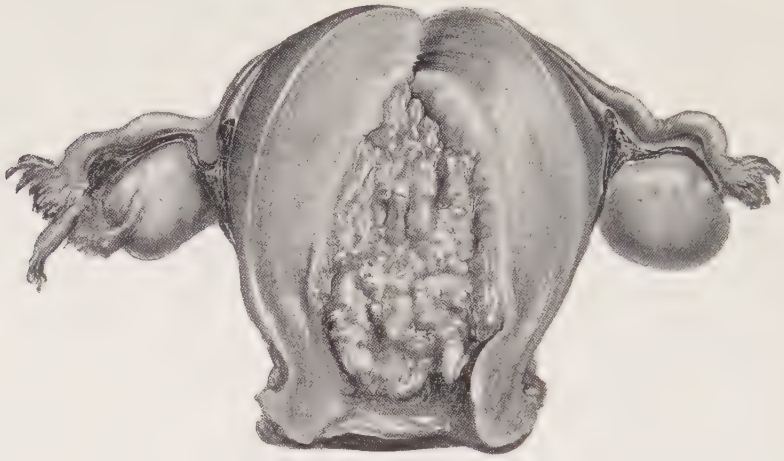


Fig. 265.—Diffuse adenocarcinoma of the body of the uterus.

Symptoms and **diagnosis.**—In many cases the disease is well advanced before any symptoms arise; sometimes there is a slightly foul, bloodstained discharge early in the disease, but as a rule the first symptom to attract attention is severe and recurring haemorrhage. As the disease advances haemorrhages become frequent and the discharge continuous and foul. Pain is absent until quite late in the disease.

Fig. 266.—Circumscribed adenocarcinoma of the body of the uterus. (*Winter & Ruge, 'Gynäkologische Diagnostik.'*)

In these ordinary cases one finds on bimanual palpation that the uterus is enlarged and freely movable.

The only other diseases which can produce the same amount of haemorrhage, the enlargement of the uterus and the foul discharge are a sloughing submucous fibromyoma and sarcoma of the uterus.

Against the diagnosis of fibromyomatous polyp may be the absence of painful uterine contractions, although in some cases of adenocarcinoma painful contractions do occur.

There is yet another source of difficulty in diagnosis. When the carcinoma is advanced it tends to spread through the uterine wall

at various points and in doing so to produce bosses on the surface of the uterus which may be mistaken for subperitoneal fibromyomata. Once the peritoneal cavity has been opened the deep red colour of the uterus affected with malignant disease or the paler colour of the fibromyomatous uterus should enable the operator to settle the question

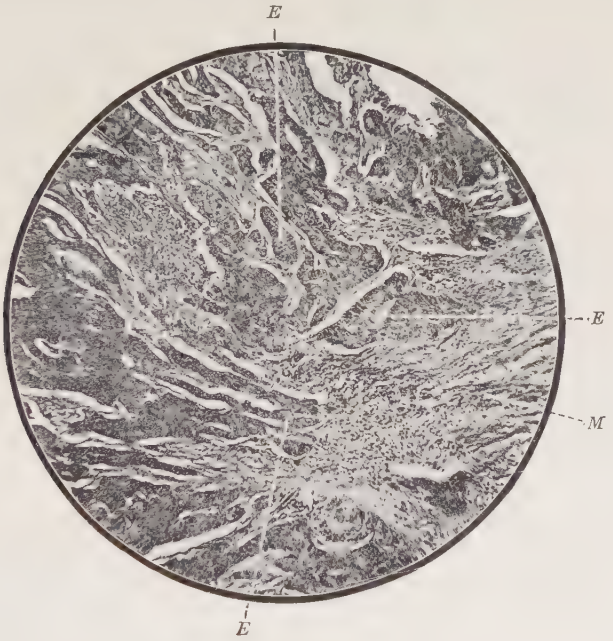


Fig. 267.—Adenocarcinoma of the body of the uterus. Masses of columnar epithelium in an irregular gland formation (*E*) are invading the muscle wall of the uterus (*M*). ×150. (*Photomicrograph.*)

as to condition he has to deal with. The age of the patient, and the previous history indicating absence of fibromyomata in the uterus, should, however, prevent much difficulty in a simple case. At the same time it must always be borne in mind that carcinoma of the body of the uterus is not a very unusual accompaniment of fibromyomata uteri.

Pyometra, caused by blockage of the cervical canal by the growth and the collection of purulent discharge in the uterine cavity, may give rise to considerable difficulty in diagnosis, for there is in these cases no vaginal discharge. There are, however, other symptoms apart from the history which may give assistance. The patient may suffer from the effects of septic absorption and have a hectic temperature; it is not uncommon, too, to find in these cases that pelvic adhesions have been formed as the result of the spread of infection through the uterine walls. In such circumstances the diagnosis can be completed by

opening up the cavity of the uterus *per vaginam*, when pus will escape.

In early and doubtful cases of adenocarcinoma it is always advisable to curette the interior of the uterus, and to make a microscopical examination of the fragments obtained.

The **progress** of adenocarcinoma of the body of the uterus is slow—much slower than carcinoma of the cervix—and the disease is limited to the uterus until quite a late stage. The lymphatic glands, also, are infected late in this disease. Those eventually involved are the *lumbar glands*, and, in rare instances, the *inguinal glands*, to which the infection may spread from the uterine horns by way of the round ligaments (see fig. 63, p. 64).

Metastases only occur very late in the disease.

The **prognosis** is good if the uterus be removed in reasonable time—that is, while the disease is definitely limited to that organ and before the peritoneum or lymphatic glands are involved.

CHORIONEPITHELIOMA OF THE UTERUS. — This disease, originally believed to be sarcomatous in nature, is now considered to be carcinomatous.

Almost all the cases recorded have supervened upon pregnancy, abortion, or the extrusion of a hydatidiform mole (40 per cent.); so that it is always found in woman during the child-bearing period, the average age being a little over thirty years.

Pathology.—If detected early a small nodular growth, which has not broken down, may be found in the uterine wall. The disease spreads rapidly, however, and the uterus is soon extensively invaded by a friable, haemorrhagic and breaking down growth (fig. 268).

Microscopically (fig. 269) the tumour is found to be made up of two principal elements. (1) Large polyhedral cells which stain lightly. These were originally supposed by Sänger, who first described the disease, to be derivatives of decidual (maternal) cells, and consequently he thought the growth to be sarcomatous. But it has now been shown that these cells are derived from the cells of Langhans' layer, which is foetal ectoderm. (2) Masses of multinucleated protoplasm in which cell boundaries are unmarked (syncytium); these are often extensively vacuolated.

Large spaces filled with blood can always be seen. Aggregations of leucocytes are also common.

Symptoms, course and **diagnosis.**—The earliest symptom of this disease is a violent haemorrhage which may soon be repeated; this may give rise to the fear that there are retained products of conception. The first haemorrhage may occur a fortnight after the termination

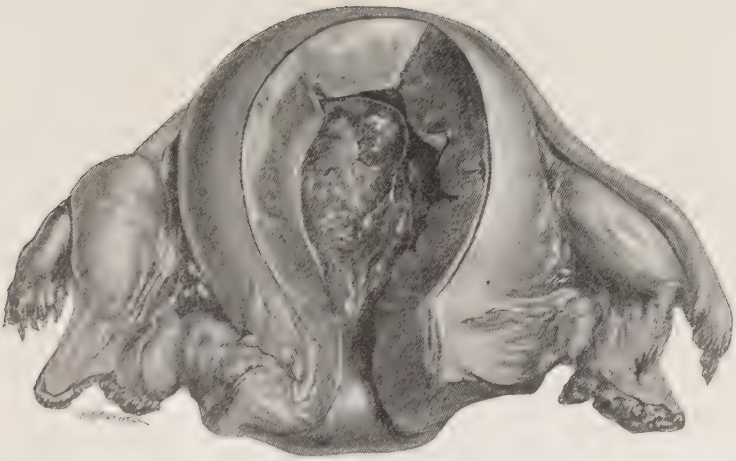


Fig. 268.—Chorionepithelioma of the uterus. The uterus has been opened posteriorly and the growth is seen on the anterior wall. There is a boss on the external surface of the wall corresponding to the growth, but this cannot be seen, of course, in the illustration. It will be noticed that there are no lutein cysts in the ovaries.

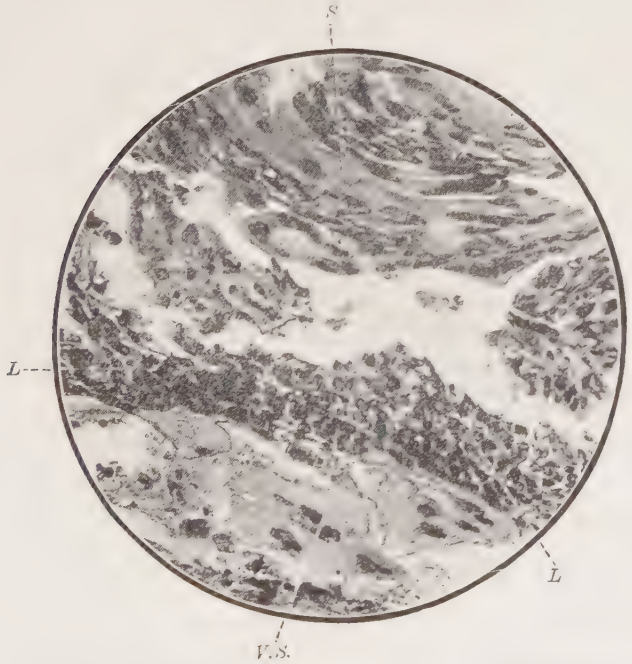


Fig. 269.—High power view of a section of chorionepithelioma. × 420. (*Photomicrograph.*)

S. Mass of proliferating syncytium in which many large nuclei can be seen. *V.S.* Vacuolated syncytium. *L.* Rapidly proliferating cells from Langhans' layer.

of the pregnancy, abortion or expulsion of the hydatidiform mole. In every case, therefore, in which persistent bleeding follows an abortion, pregnancy or hydatidiform mole, a portion of the contents of the uterus should be examined microscopically.

If no treatment be carried out the haemorrhages continue, and as the growth breaks down a foul discharge is also noticed. At this stage the presence of a sloughing submucous fibromyoma may be suspected.

Early the uterus is found to be free on bimanual palpation, and enlarged. Later it is found to be greatly increased in size and fixed, while the pelvis may be filled with growth.

Metastases rapidly occur in the lungs, vagina and other parts of the body. The lymphatic glands are hardly ever infected.

The *ovaries* have very frequently been found to be cystic, and the cysts are often coloured red or yellow by lutein tissue and blood (lutein cysts).

The **prognosis** is very bad unless operation be undertaken early. The patient may die as early as six months after the onset of the disease.

Treatment.—Early hysterectomy is the only treatment of the slightest use. All cases not operated upon early die. A few cases have been recorded in which secondary deposits have disappeared after the removal of the primary growth, so that the uterus should always be removed when this is feasible.

SARCOMA OF THE BODY OF THE UTERUS.—This is a rare disease which most commonly affects women between the ages of forty and fifty.

Three varieties are described:

(1) The circumscribed ordinary sarcomata.

(2) The diffuse ordinary sarcomata.

(3) Endothelioma and perithelioma.

The **circumscribed** form of growth arises in the uterine wall, and it may be round-celled, mixed-celled, or long spindle-celled in structure. The disease probably arises in the connective tissue, but some authorities believe that the spindle-celled variety originates in the transformation of the uterine muscle cells or of a fibromyoma into a sarcoma. Certainly it is usual for this growth to be removed under the impression that the tumour is fibromyomatous (fig. 270), and then to find on microscopical examination that it is wholly or partly sarcomatous. Figure 271 is an illustration of a section of such a growth. It will be seen to differ in structure from a fibromyoma in

Fig. 270.—Sarcoma of the uterus (associated with subperitoneal fibromyomata). (*From Roberts'* '*Gynaecological Pathology.*')

A. Sarcomatous disease invading the uterine wall. *B*. Necrotic portion of growth. *C*. Cervix uteri. *D*. Subperitoneal fibromyomata. *E*. Fallopian tube.

the large size and roundness of the nuclei and in the comparative shortness of the cells; also the structure is very cellular, and there is little connective tissue. Further, sarcomata infiltrate the neighbouring tissues, whereas fibromyomata remain encapsuled.

The **diffuse** variety arises from the connective tissue below the endometrium, and, spreading rapidly, soon lines the uterine cavity with a breaking down and friable growth. It is probable that many of the cases described are carcinomatous rather than sarcomatous, and when sarcomatous belong to the group of tumours known as endotheliomata and peritheliomata.

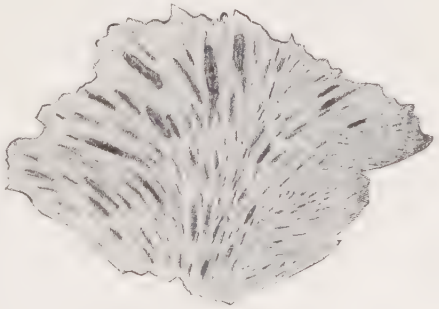


Fig. 271.—Spindle-celled sarcoma of the uterus. Note the large nuclei of the sarcoma cells on the left and the small elongated nuclei of muscle fibres on the right. (*Winter & Ruge,* '*Gynäkologische Diagnostik.*')

Endotheliomata and peritheliomata.—*Endotheliomata* arise from the endothelial cells of lymphatics or blood vessels, and by proliferation growths are produced which not only project into the lumina of the vessels, but also break through and surround them with rapidly increasing cellular masses.

Peritheliomata originate from the adventitia of blood vessels and lymphatics. An illustration of such a growth of the uterus is shown in figure 272, and a microscopical section of it in figure 273.

Fig. 272.—Perithelioma of the uterus. Note the diffuse invasion of the cavity of the uterus.

Endotheliomata and peritheliomata associated with fibromyomata have occasionally been described.

From the above brief descriptions of the known varieties it will be seen that differences of opinion exist as to the pathological nature and the mode of origin of sarcomatous growths of the body of the uterus.

The circumscribed ordinary variety is often quite distinct; but the diffuse form and the endotheliomata and peritheliomata have probably been confused, and they may eventually be classified together.

Symptoms and **diagnosis.**—The symptoms are not very distinctive, especially in those cases in which the growth is circumscribed, and in which there are, also, fibromyomatous tumours in the uterus. The appearance of sarcoma produces only an aggravation of the symptoms associated with fibromyomata—*haemorrhage* becomes more frequent and severe, but in addition there is, when the growth breaks down, a *foul discharge.* Pain is rarely present early in the disease.

From these symptoms it is hardly possible to make a differential diagnosis from carcinoma, chorionepithelioma, or a sloughing fibromyoma, unless a fragment be obtained from the interior of the uterus for microscopical examination.

In older patients, especially when the growth is endotheliomatous or peritheliomatous in nature, the symptoms are slight—perhaps a little bleeding only—and the course very slow. In these cases the

disease may be attributed to senile 'endometritis,' until a histological examination has been made.

Course and prognosis.—The rapidity of growth and the consequent prognosis depend to a large extent upon the age of the patient. In patients under fifty years of age the prognosis is very grave; in older patients it is not nearly so serious. With the younger patients the disease tends to spread rapidly, and, extending beyond the uterus, to invade the surrounding structures. The uterus then becomes quite fixed.

Fig. 273.—Perithelioma of the uterus. On the right the blood vessels (*B*) are seen to be numerous and to be surrounded by masses of proliferating cells. ×75. On the left a single blood vessel (*B*) is seen surrounded by proliferating cells (*C*). ×420. (*Photomicrograph.*)

Chronic inversion of the uterus has been caused not infrequently by polypoid sarcomata.

Metastases are not uncommon, and are most usually found in the lungs.

Treatment.—Hysterectomy must be performed in every case when this is practicable; that is, when the uterus is not too fixed.

It is advisable in most cases to perform abdominal hysterectomy, although in old subjects in whom the disease has not advanced far vaginal hysterectomy may be the operation of choice.

§ iv. MALIGNANT DISEASES OF THE FALLOPIAN TUBES.

Secondary malignant disease may occur by extension from a primary focus in the uterus or ovary, or even from other adjacent pelvic organs. It is always a late process of the original disease, but as secondary growths have no special interest apart from the primary growths we need not discuss them here.

Primary malignant disease of the Fallopian tubes, which is rarely met with, may occur in the following forms:

(1) Adenocarcinoma.
(2) Chorionepithelioma.
(3) Sarcoma.

ADENOCARCINOMA arises from the epithelial lining.

Previous inflammation of the tube is an important predisposing factor. The disease is frequently bilateral.

Macroscopically the tube is enlarged and may contain pus; the growth is generally, although not always, papillomatous in appearance, and it is usually impossible to say by the naked-eye appearances whether the growth be innocent or malignant. Microscopically this is easily determined owing to the invasion of the muscular wall of the tube by the proliferating cells, which are seen to be collected in large epithelial masses (fig. 274).

The **symptoms, physical signs** and **diagnosis.**—The patient suffers from a foul smelling, watery and sometimes bloodstained discharge, associated with a considerable amount of pain and abdominal tenderness.

On examination a large fixed and tender mass can be felt on one or both sides. There is fixation of the uterus.

Diagnosis is not easy; often it is impossible to differentiate between a tube affected with malignant disease and an ordinary pyosalpinx, until the later stages when extension of the disease, with ascites, and emaciation of the patient may enable a correct opinion to be formed.

The **treatment** consists in removal of the tubes, ovaries and uterus at the earliest possible moment.

In this connexion it may be urged that even at the operation a definite diagnosis cannot always be made. This, however, should not deter the surgeon from reopening the abdomen as soon as he knows the nature of the growth if he think he can add to the patient's

future security by a freer removal of parts than was originally practised.

Fig. 274.—Adenocarcinoma of the Fallopian tube. (*From Orthmann's 'Gynaecological Pathology.'*)

A. Papillary proliferation of the mucosa covered with many layers of epithelium. *B*. Solid epithelial masses in cancerous alveoli in the muscle wall. *C*. Muscle fibres.

CHORIONEPITHELIOMA OF THE FALLOPIAN TUBES.—This may be primary, and follow a tubal pregnancy or a tubal vesicular mole.

The **pathology** of the condition is the same as when the disease occurs in the uterus.

The **diagnosis** is practically impossible before operation in the absence of secondary deposits, unless there be a clear history of tubal abortion from which the patient has recovered.

The physical signs are those of a rapidly growing tumour of the tube, which soon becomes fixed and invades the surrounding structures.

Treatment consists of early operation. This would probably be undertaken in most cases in the belief that the 'mass' in the pelvis was inflammatory.

SARCOMA of the tube is even rarer than adenocarcinoma. Many of the recorded cases have probably originated elsewhere, and spread to the Fallopian tube. The physical signs are similar to those of carcinoma of the tube, but with sarcoma the affected part is freely movable until a later stage of the disease, likewise the profuse watery discharge is not seen until later, if at all. Macroscopically

the growth may to some extent be distinguished from carcinoma in that it is not papillomatous. Microscopically most cases have been found to be the ordinary round-celled variety of sarcoma (fig. 275).

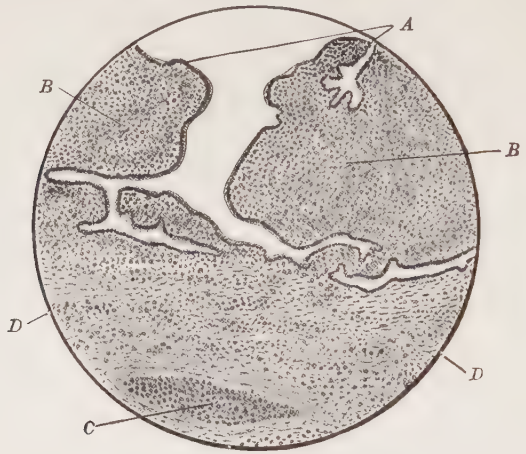


Fig. 275.—Round-celled sarcoma of Fallopian tube. (*From Orthmann's 'Gynaecological Pathology.'*)

A. Compressed but otherwise normal superficial epithelium. *B*. Round-celled sarcoma of the mucous membrane. *C*. Lymph channel packed with sarcoma cells. *D*. Muscle wall invaded by sarcoma cells.

§ v. MALIGNANT DISEASES OF THE OVARY.

Secondary malignant disease, the result of extension from growths in neighbouring organs, may occur in the ovary, as in the Fallopian tube. This form we shall not consider further.

Primary malignant disease may be

(1) Carcinomatous,
(2) Chorionepitheliomatous,
(3) Sarcomatous,
or (4) Teratomatous.

CARCINOMA OF THE OVARY is found either in the form of *solid* or *cystic* growths, and the latter may be glandular or papillary.

Solid malignant growths arise from the 'germinal' epithelium or Wolffian relics when primary in origin. Many consider that solid malignant ovarian tumours—which are frequently bilateral—are invariably secondary to growths in the breast, intestine, or elsewhere. In such cases the disease has the microscopical appearances of the primary affection. If primary in the ovary they are adenocarcinomatous. These

tumours are seldom very large, and are rounded and fairly smooth, but as the disease progresses the growth becomes firmly attached to the surrounding structures, which are rapidly invaded. On macroscopical examination the tumour is usually found to be soft and brain-like, and haemorrhages into its substance are not uncommon.

The **diagnosis** is usually easy by the time the patient presents herself. The physical signs of solid growths in the pelvis, the ascites and the emaciation can rarely be mistaken. Earlier, of course, if the patient submitted herself for examination one would find merely an enlarged ovary which might be quite free. These and all malignant ovarian tumours, especially in the early stages of their growth, may give rise to menorrhagia in women before the menopause.

The age of the patient (forty to fifty years) may be of assistance in making the diagnosis.

The **treatment** consists of early removal.

Cystic malignant growths.—As already stated, these are either glandular or papillary.

Glandular carcinoma (adenocarcinoma) frequently develops in previously innocent cystadenomata in women over forty years of age. It has been stated on very good evidence that 40 per cent. of all cases of cystadenomata in women over that age can be proved to be malignant in some part or another of the cyst wall. The growth tends to spread through the cyst wall, and may lead to perforation with the escape of the contents.

The histological appearances of such a growth are illustrated in figure 276, in which great proliferation and irregularity of the atypical columnar epithelial elements, arranged in glandular formation, are seen.

The **diagnosis** can often be made with a fair degree of certainty. If the patient be over forty years of age and have had for many years a cyst, which has gradually become painful, and in which the pain is sometimes quite acute, we may infer that some change is going on in the cyst wall. In the later stages of the disease there may be ascites. If we can exclude torsion and inflammatory changes it is usually safe to make a diagnosis of malignant disease.

Treatment.—Cystadenomata should always be removed without tapping; if this be done, and the disease have not spread beyond the cyst wall, the prognosis is good.

Papillomatous carcinoma is generally primary, but it is said to develop from innocent papillary tumours. Microscopically the malignant papillary tufts are seen to be covered with many layers of epithelium, and there is so great a proliferation that aggregations of epithelial cells are also to be seen in the stroma (fig. 277).

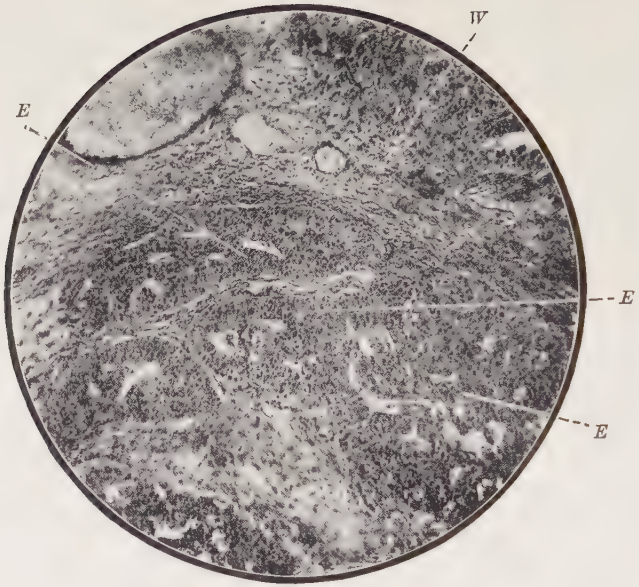


Fig. 276.—Primary adenocarcinomatous invasion of ovarian cyst-adenoma. Masses of columnar epithelium (*E*) in irregular gland formation, in which the individual glands are not separated by connective tissue, are seen invading the cyst wall (*W*). ×150. (*Photomicrograph.*)

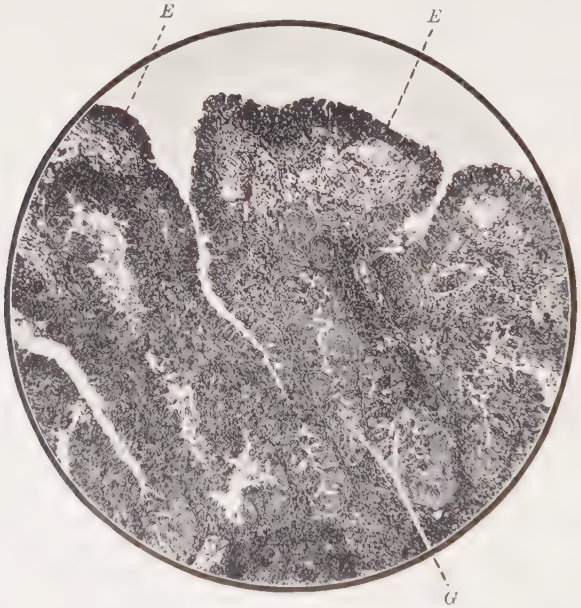


Fig. 277.—Papillary adenocarcinoma of the ovary. The papillomata are covered with several layers of columnar epithelium (*E*), and in the stroma of the papillary growths are masses of columnar cells arranged in glandular formation (*G*). ×100. (*Photomicrograph.*)

The pathological diagnosis of papillary growths in regard to their innocency or malignancy depends entirely on the invasion of the stroma by epithelial cells. However many layers of columnar epithelium there may be on the surface of the papillary tufts the condition is not necessarily malignant unless the stroma be involved (see p. 344). There is no doubt that a large proportion of all papillary tumours of the ovary are primarily malignant.

The growth rapidly becomes fixed in the pelvis, and there is a great effusion of ascitic fluid.

Generally the diagnosis as to the actual nature of the malignant disease is not certain, for the whole pelvis may be filled with the tumour. The great irregularity and fixation of the 'mass,' and its rapid extension may distinguish this form of growth from the solid and more circumscribed form of adenocarcinoma.

Operative treatment is generally contraindicated, owing to the impossibility of removing all of the papillomatous disease.

In malignant ovarian disease metastases in distant organs are uncommon, infection of the peritoneum being the usual mode of progression.

CHORIONEPITHELIOMA OF THE OVARY as a primary disease is extremely rare, although not unknown.

It may arise in the following ways:

(1) As the result of an ovarian pregnancy.

(2) As a malignant metastasis of an 'innocent' chorionic invasion in the uterus.

(3) Independently of pregnancy.

Owing to the extreme rarity of this disease there is very little to be said about it.

Pathologically the growth resembles chorionepithelioma elsewhere and is extremely malignant in its course.

Early removal is the only method of treatment.

SARCOMA OF THE OVARY is not very common, but may occur at any age. The disease may be unilateral or bilateral.

We recognize several varieties: the soft *round-celled sarcoma* which may contain cystic cavities or spaces full of blood; a *spindle-celled* variety which is very hard; and lastly *endotheliomata and peritheliomata*. More rarely '*malignant melanomata*' and *mixed-celled sarcomata* have been found. In figure 278 is seen a beautiful example of the mixed-celled variety.

The endotheliomata and round-celled varieties are the most malig-

nant, and tend to invade the surrounding structures. The spindle-celled tumours occur in older women, and are less malignant.

Symptoms and diagnosis.—There is usually some ascites, but this occurs with ordinary fibromata of the ovary, so that diagnosis is not

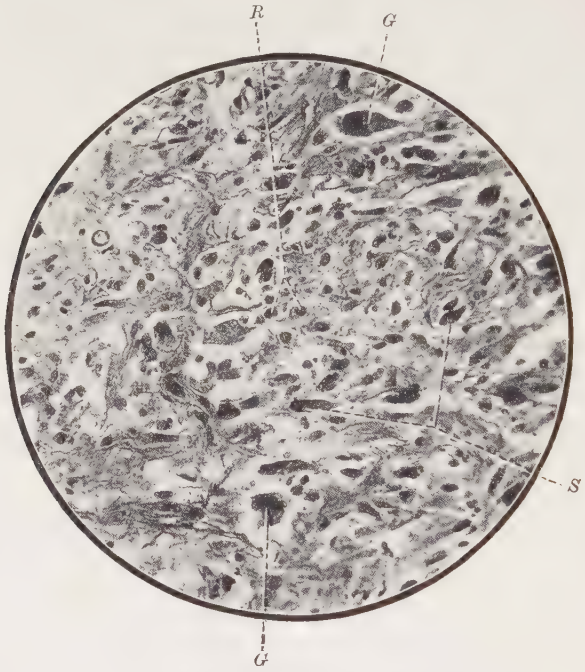


Fig. 278.—Section of a mixed-celled sarcoma of the ovary. ×300. (*Photomicrograph.*)

G. Multinucleated cells. *S.* Spindle cells. *R.* Small round cells.

easy. All we can do is to make a conjecture, when the patient is young and we can feel a softish solid ovarian tumour, that it may be sarcomatous.

Treatment consists of early removal.

TERATOMATA of the ovary are usually malignant when solid. We have already discussed the cystic teratomata (dermoid cysts) and have seen that they are for the most part innocent. The solid tumours have no definite capsule.

These tumours usually occur in quite young adults, and grow very rapidly, producing metastases resembling the primary disease. To the naked eye these growths are usually ovoid in shape with an irregular surface. The structure on macroscopical section is varied and small cysts may be seen. If the disease be advanced invasion of the neighbouring structures will be found.

Microscopically the growth appears to contain epithelial and connective tissue elements in hopeless confusion, so that sometimes it is impossible to say whether the tumour be carcinomatous or sarcomatous.

The **diagnosis** is not difficult as the tumour is so rapidly growing, and occurs chiefly in young women.

The **treatment** consists of early removal.

CHAPTER XIV.

ALLIED MORBID CONDITIONS.

THERE are many morbid conditions which may fall into the province of gynaecology; either because they affect the sexual organs directly by reason of their anatomical propinquity, or because definite disturbances of the genital functions are secondarily produced by the effect of these diseases on the organism, and *vice versa*. It will be advisable, therefore, to group this important, if more or less anomalous, collection of conditions together, although in some instances allusion has previously been made to them in dealing with certain of the symptoms produced in disorders that have already been under discussion.

We will first consider those diseases elsewhere in the body which secondarily affect the genital organs, or are themselves produced by disturbances of the genital functions.

§ i. GENERAL DISEASES.

DISEASES OF THE DUCTLESS GLANDS. Disease of the thyroid gland.—There is little doubt, as has already been stated, that the thyroid gland is closely associated with the genital functions; so that we expect to find these functions disturbed in diseases of this gland, and *vice versa*.

When there is total absence of the gland, or in the less serious condition of *hypothyroidism*, there is either sexual infantilism with absence of sexual functions, or the functions may be, as in *myxoedema*, in abeyance so long as the disease exists. If the disease be discovered in good time, and thyroid gland administered, the sexual functions may be reestablished. For instance, a woman developed myxoedema with consequent amenorrhoea; on the administration of thyroid gland the patient not only started menstruating again, but became pregnant and was safely delivered. This has probably often happened.

It has also been previously mentioned that *hyperthyroidism*, and *exophthalmic goitre* in the early stages are frequently associated with excessive menstruation.

It is, further, important to remember that double oöphorectomy may be followed by enlargement of the thyroid. In one case exophthalmic goitre was actually developed, but eventually disappeared.

These questions have, however, been sufficiently discussed—considering the present imperfect state of our knowledge—so that it is not necessary to do more here than to reimpress on the student the correlation existing between the thyroid gland and the ovaries.

Pituitary disease has also been mentioned as being productive of amenorrhoea and sexual infantilism. It is only with destructive lesions of the anterior lobe (hypophysis) that these results are seen.

Adrenal disease probably has a similar influence to pituitary (infundibular) disease, but sufficient cases have not been studied to enable us to state the exact relationship. It has, however, been recently shown that the administration of adrenalin has a most beneficial action in arresting the progress of osteomalacia. Since we know clinically that in many cases oöphorectomy cures osteomalacia we may conclude that the adrenals and ovaries have at least an antagonistic action in certain metabolic processes concerned in the deposition of lime salts.

MORBID CONDITIONS OF THE NERVOUS SYSTEM.—Ordinary chronic diseases of the spinal cord or gross lesions of limited areas of the brain such as apoplexy, and tumours—unless in the vicinity of the pituitary body—do not appear to produce much effect upon the genital system. Even in parturition the muscular contractions of the uterus, owing to the sympathetic nerve supply, are not affected by paraplegia. The paralysis of the abdominal muscles, of course, adversely interferes with the progress of labour, but beyond this the course of that process is not impeded.

In other more obscure nervous diseases, that is to say in those which are called 'functional,' there appears to be a close correlation with the genital organs; and it is possible that before long these metabolic nervous disorders will be more completely understood in regard to their effect upon, and the part played by, the sexual organs. It is probable that this will come to pass when the full relationship of the ductless glands to one another and to the organism as a whole stands revealed. Even now we recognize in a philosophical sort of way that temperament and character are dependent upon the metabolism of the body. This is illustrated by the different

temperaments of hyperthyroidic and hypothyroidic individuals; so that in that time when our knowledge is more complete we may be able to treat those most difficult of all cases—the neurotic—by regulating the body metabolism.

We now recognize, then, that the sexual organs of women are often in intimate relationship with 'functional' diseases; and it is necessary to see how we stand at the present time in regard to treatment of disorders which are at once the despair of every practitioner and the nightmare of the gynaecologist to whom they are referred on the off-chance that the retroversion of the uterus, dyspareunia or menorrhagia is the *fons et origo mali*. Indeed, how often are such conditions seized upon with avidity by the despairing physician as something tangible upon which to act? Yet almost as surely as the displacement, or whatever it may be, is relieved the shadow falls in another place!

This difficult subject will best be considered if we attempt to arrange the various so-called 'functional' nervous disorders in some sort of way. Our present knowledge is not enough to enable us to make a definite division according to causal factors. We can only arrange the cases in some such manner as the following:

(1) Psychoses not dependent on pathological conditions of the genital organs.
(2) Psychoses dependent upon pathological conditions of the genital organs.
(3) Neuroses not dependent upon the genital organs.
(4) Neuroses dependent upon the genital organs.

(1) Psychoses not dependent upon the genital organs.—We have already discussed in Chapter VIII. the influence mental diseases of this nature have upon genital functions. So that we need do no more here than state again that the melancholic types of mental disease are frequently associated with amenorrhoea or scanty menstruation, while the more active types are often associated with menorrhagia.

(2) Psychoses dependent upon the genital organs.—A considerable number of cases of mental disorder dependent upon the genital organs has now been recorded, particularly in regard to abdominal tumours. In some of these cases a cure has followed the removal of a large growth; in others no particular benefit has resulted. In some of the latter, however, it is possible that earlier operation before the mental disease became established might have led to a better final result. On the evidence before us it would seem advisable to examine all women with incipient insanity, and if definite lesions of the genital organs be found—especially cystic ovaries and fibromyomatous uteri—to remove the diseased part.

No harm is likely to result *so long as both ovaries, or both ovaries and uterus are not removed,* and in some cases a cure may follow. The removal of both ovaries, or both ovaries and the uterus, in mentally healthy women has sometimes induced melancholia, or profound and incurable neurasthenia.

There is another class of case which, although somewhat rare, must be mentioned. Sometimes temporary insanity follows an operation on the genital organs (*postoperative psychosis*) even when nothing is removed. For example, ventrifixation for procidentia was performed on a woman about fifty years of age. As far as the local conditions were concerned the patient made an excellent recovery, but a few days after the operation she became completely insane. The insanity was of the sexual type. At the end of ten days she recovered suddenly and completely, and when seen some years later was quite well.

(3) **Neuroses not dependent upon the genital functions** form a class which is somewhat difficult to establish, for it is quite possible that many of these obscure conditions are in some way dependent upon sexual activities, although the relationship may, perhaps, not be apparent. It is, however, convenient to consider the 'neurotic patient —pure and simple,' as we optimistically or pessimistically call her, in a separate class, and apart from those patients in whom there is actual mental disease. This is quite arbitrary, as the border-line is very narrow.

Some of these women become neurotic from no apparent cause. They have perhaps inherited a neurotic temperament. In others the disease—for such it is—can be traced to some illness from which the patient has never completely recovered, or which has run a prolonged and chronic course.

In many of these patients we may find such conditions as a retroverted mobile uterus, dysmenorrhoea, vaginismus, and similar troubles, for which not infrequently they seek our advice.

The management and successful treatment of these cases is difficult, but it must not be undertaken in a hopeless spirit—as is so often the case—for determination and hopefulness on the part of the medical attendant are important factors in the issue. These it is that make some practitioners more successful than others with this particular class of case.

In the first place it is most important to enquire carefully into the home surroundings and circumstances of the patient. In some a definite cause—mental worry, anxiety, or the strain of an exciting life —may be discovered, and advice offered by the medical attendant will be well received and acted upon, if tactfully given.

In the more serious cases the patient loses her appetite, has all

manner of aches and pains; is ready to cry if a button comes off her glove, and even to have an 'hysterical attack' if sympathized with concerning the accident!

Every woman is by nature intended to be plump. Very few women are really well if they be excessively thin, unless this be due to physical exercise, when for a time the patient may retain her health although not covered with fat. In the end these women, also, are liable to become neurotic. Those, however, who get thin without exercise, while living in the lap of luxury, or when working hard for their living, are the individuals who form the bulk of our neurotic patients. In each class of case the same treatment is applicable—change of environment, discipline and a process of fattening. This is best carried out by what is now well known as the Weir-Mitchell treatment, after the famous physician who introduced it.

The patient is taken away from her own surroundings and placed in a nursing home or hospital. She is 'stuffed' with food, made to indulge in Swedish exercises and is massaged; otherwise she is kept at rest. Under this treatment thin women sometimes put on twenty-eight pounds in weight in two months.

As a rule it is necessary to cut the patient off from friends and relations, especially for the first few weeks. In these circumstances it is obvious that a clever and tactful nurse is of great value.

Unfortunately the treatment cannot be carried out quite so effectually in the ordinary hospital ward, consequently this method is only within the reach of the rich. 'Modified rest-cures,' as one hears certain courses of treatment described, are as a rule useless in bad cases.

(4) **Neuroses dependent on the genital functions.**—These are not at all uncommon, but they are rarely seen before the fourth decade of life. This very fact, that a woman over thirty *becomes* neurotic although in her younger life she was normal, often affords strong evidence that there is some definite causal factor in her genital system. This is the more apparent when we find a definite lesion which may have been the cause of much suffering; on the other hand there is a less definite class of case in which the patient is the victim of some disturbing factor dependent on her genital metabolism.

Firstly, then, there are the women who have prolapsed ovaries and puerperal retroversions of the uterus. The constant pain, the dyspareunia and other symptoms not uncommonly produce a marked effect upon the patient's nerves. These cases are readily cured by adequate treatment of the local condition, if attended to in good time. Sometimes a prolapsed ovary in a young girl may account for her neurotic symptoms; so that, when found, prolapsed organs should

always be dealt with by operative procedures, as soon as the practitioner is convinced that they are the source of much pain or disturbance of function. Prolapsed ovaries, however, are not common in young, unmarried women.

Secondly there are the more obscure cases in which the patient is suffering from the unsatisfied functions of her sex: and how common these cases are among unmarried or sterile women of thirty-five to forty years of age, with perhaps insufficient occupation and abnormal introspective or philosophical tendencies! Such women are often found in the vanguard of the ranks of female agitators. They are not, however, entirely a recent product, for they were well known to the Romans.

Civilization produces the condition, but has not yet provided a cure. There is some reason to believe that hyperactivity of the ovaries—analogous to hyperthyroidism—is the chief pathological factor, and good results may follow the removal of *one* ovary. Indeed, one miserable neurotic patient who had been married for eleven years without becoming pregnant, promptly conceived and gave birth to a healthy child within a year of the operation, and was thenceforth herself a different woman.

Removal of an ovary, however, is a serious measure and must be carefully considered before being put into practice, for it is extremely unlikely that good results would follow in every case. It is, however, a scientific procedure, in view of the wonderful effects of the modern operations for excessive thyroid activity, and may be considered comparable to partial thyroidectomy. If there were any sentimental objection to entire removal of an ovary three-fourths might be resected as an alternative and less 'sweeping' procedure—for naturally and rightly women set considerable store by an organ to which there is attached so much sentiment, and it would never be advisable to give any woman, who was likely to be introspective in the matter, fresh food for her morbid reflexions.

The menopause and its influence upon the nervous system has already been discussed in Chapter VIII.

OTHER GENERAL DISEASES.—Diabetes is frequently discovered by the gynaecologist, for it is one of the commonest causes of *pruritus vulvae*. Some have thought that this condition is caused by the sugar-containing urine, but this is probably not the case, since pruritus frequently occurs in sites that could not possibly have been directly affected in this way.

Acute fevers sometimes produce what may almost be described as specific effects.

Mumps not uncommonly gives rise to metastatic infection of the ovaries: this causes a specific form of oöphoritis which produces enlargement and tenderness of the ovaries. Recovery is usually complete. Sometimes the mammary glands are similarly affected.

Measles may be associated with a gangrenous condition of the vulva known as *noma*: this is comparable with *cancrum oris*.

In **typhoid fever**, also, vulval ulcerations are sometimes met with. All acute fevers may be associated with menorrhagia and metrostaxis.

Heart disease, **Bright's disease and chronic alcoholism** have already been discussed in regard to the production of menorrhagia.

Debilitating diseases such as tuberculosis have been mentioned among the causal factors of amenorrhoea.

Blood dyscrasias, which include the various anaemias and haemophilic conditions, have also been considered in Chapter VIII.

§ ii. LOCAL DISEASES: PELVIC, ABDOMINAL AND VULVAL.

URINARY SYSTEM.—The bladder and urethra from their proximity to the uterus and vagina are frequently affected by diseases of those parts, and in the same way diseases of the bladder may extend to the genital tract.

Growths of the bladder are not uncommonly seen. As a rule the growth springs from the base of the bladder, and, if malignant, may spread to the uterus and vagina; in this way fistulae may be formed.

The symptoms of tumour of the bladder are dysuria and the passage of blood on micturition—generally at the end of the act.

Frequency of micturition and incontinence of urine due to 'functional' causes are very common in young women and girls; but, as these symptoms also occur in early pregnancy, with various pelvic tumours and with cystitis, it is important always to discover whether there be any organic basis for the trouble. In the majority of 'functional' cases the condition is due to deficient sphincter control. The female urethra is not well designed to control the escape of urine, and many women experience some difficulty in this respect when they have a bad cough. The life of the patient may, however, become quite a burden to her owing to her inability to 'hold her water' under any circumstances. In some cases the urine is only passed involuntarily during sleep.

Various operations upon the urethra have been designed to rectify the trouble, but they are rarely successful. If the patient only pass

her urine involuntarily at night she should make it a rule to drink nothing for some hours before retiring, and before getting into bed she should voluntarily pass her water, and make provision for being roused every three hours during the night, until she has become quite cured of the habit. The patient should never sleep on her back. General hygienic treatment and tonics may assist in the cure.

If the urine be passed involuntarily during the day as well as at night the following mixture may be found useful:

R. Tincturae Belladonnae, - ℥ v
Infusionis Chirettae, - ℥ ss.
M. Sig. ℥ss. t.d.s.

The quantity of belladonna should be gradually increased until the patient shows ocular symptoms, or suffers from dryness of the throat. The maximum dose given must be taken for a month; after this the dose should be decreased gradually in the same ratio as the increase was made. In very bad and obstinate cases the patient must be confined to bed and subjected to a course of massage and Swedish exercises. In these circumstances the nurse must make the patient empty her bladder every three hours night and day.

Recently attention has been called to the fact that many of the girls who suffer from incontinence of urine are hypothyroidic, and in these cases excellent results are said to follow the administration of thyroid gland. This may always be prescribed, therefore, if no local cause of the trouble be discovered.

Cystitis and urethritis.—Inflammation of the bladder in women is of some little importance, and, being frequently associated with gynaecological disorders, demands consideration here. Urethritis apart from that produced by gonococcal infection is unimportant and will not be considered in detail.

It must not be forgotten that normally bacteria are found in the lower part of the urethra, consequently if the resistance of the patient be lowered urethritis may arise and the organisms present may reach the bladder, or be conveyed there from the urethra by the passage of instruments.

For the sake of clearness it will be better to classify cystitis according to whether the infection be direct and independent of the genital organs, or whether it be an associated or dependent affection. In the latter class we must include those cases in which the presence of disease in the uterus or elsewhere, without directly infecting the bladder, may be the means of reducing its resistance by injury to its coats, and so indirectly conduce to an independent infection of that viscus.

(1) Cystitis arising independently of the genital organs.—The disease may be acute or chronic, and is most commonly the result of infection conveyed from below by way of the urethra. Often, however, the infection descends to the bladder along the ureters. Besides these most usual methods, infection may also be carried by the blood stream or by extension from the bowel. Further, foreign bodies and calculi in the bladder may give rise to cystitis.

When the bladder is infected from below the gonococcus is sometimes responsible for the disease, as will be described later. But more often infection is carried directly by the careless use of dirty instruments, and in these cases the organisms most usually concerned are the bacillus coli communis, bacillus proteus, the staphylococcus and the streptococcus, but many other pathogenic organisms may give rise to the trouble; and the condition is generally acute.

Acute cystitis. Symptoms.—There is great frequency of micturition, with considerable pain after the act. Often a continuous burning pain in the hypogastrium is complained of, and as a rule there is much tenderness if the bladder be palpated by the bimanual method. The pyrexia, which may be ushered in by a rigor, is generally slight unless infection of the kidneys (pyelitis) coexist: in these circumstances the temperature may be high, rigors frequent, the pulse rapid and constitutional disturbances, such as vomiting, most marked.

In acute cystitis the urine is found to contain pus and tenacious mucus, and the reaction is always acid except when the organism concerned is the bacillus proteus (which decomposes urea with the formation of ammonia) and in one or two of the rarer infections. In very acute cases haematuria may occur. It need hardly be pointed out that in examining the urine of women it is essential that catheter specimens only should be employed, otherwise the urine may be contaminated by discharges from the vagina.

Treatment.—While the milder cases tend to recover rapidly of themselves, in the severer cases the treatment is often difficult. Hot fomentations to the hypogastrium give considerable relief, and injections of a drachm of silver nitrate (0·2 per cent.) or argyrol (2 per cent.), although often causing great immediate pain, are of much value, and should be repeated two or three times a day. Sometimes it is advisable to make an opening between the base of the bladder and vagina, in order to drain the former. It is always necessary to administer sedatives at night to ensure sleep.

When the bladder is infected through the blood stream the organism conveyed is usually the bacillus coli communis. While there is no

doubt that this form of cystitis is common some difference of opinion exists as to the mode of infection. Some authorities deny that the organism is carried by the blood, and believe that the colon bacillus passes directly from the bowel through the uninjured bladder wall. This, however, is not generally accepted as occurring during life. If the infection be conveyed by the blood stream the manner in which cystitis follows a 'chill' and septic abdominal conditions, when the resistance of the patient is reduced, is quite intelligible. In this class of case the infection is usually mild, and the disease tends to clear up of itself. Should this not follow, urotropine should be administered by the mouth in doses of five to ten grains three times a day. This drug must be administered in a very dilute form—each dose in half a pint of water after meals—otherwise gastric disturbances are likely to arise. The patient should also be encouraged to drink fluids freely, avoiding stimulants. Obstinate cases have been found to yield to treatment by autogenous vaccines, and these should always be employed when recovery is not rapid.

Cystitis due to direct infection from the bowel is not at all uncommon, and may result from appendicitis, sigmoiditis or proctitis. Should the bowel become attached to the bladder, infection of its wall follows, for the colon bacillus migrates through the attached surfaces. Occasionally a fistula forms between the bowel and bladder, and in these circumstances very serious results usually supervene owing to the rapidity with which the kidneys become infected. The treatment of cystitis due to direct infection from the bowel involves operative procedures to deal with the source of the infection, and subsequent treatment of the bladder on the lines already indicated.

Infection subsequent to the presence of foreign bodies and calculi in the bladder is due to the irritation of the mucous membrane, and consequent lowering of its resistance. It must not be forgotten, however, that calculi may form in an infected bladder, and that foreign bodies, such as hairpins, passed into the bladder may themselves become encrusted with phosphatic deposits.

Infection of the bladder from above (tuberculous cystitis, etc.).—This is caused by organisms passing down from the kidney. The commonest of these is the bacillus tuberculosus, occasionally it is the bacillus coli communis—both of which may be identified in the urine. Infection by the bacillus coli communis has already been considered.

Tuberculous cystitis is always chronic in its clinical course, and is

very intractable to treatment. The walls of the bladder may become much thickened, so that in an advanced case a hard rounded lump may be detected above the symphysis pubis, and on bimanual palpation the bladder may be felt as an almost solid tumour. If examined through an abdominal incision the muscle of the bladder wall may be seen contracting like that of a puerperal uterus.

With the cystoscope an ulcer or ulcers may be seen on the mucous membrane, or bleb-like patches of oedema recognized.

On examination of the urine pus will be found, and on careful investigation the tubercle bacilli may be detected. There is no great quantity of mucus, and the reaction is acid. The general symptoms are those usually found with tuberculous disease elsewhere, and the local symptoms those of chronic cystitis; that is to say, frequent and painful micturition, pain and a sense of weight in the hypogastrium.

Chronic cystitis. Treatment.—The treatment of tuberculous cystitis is not very encouraging, but if it be undertaken early good results are sometimes obtained. When the primary focus is in the kidney, that organ should be removed if the disease be unilateral. Any ulceration in the bladder must be scraped, and the ordinary routine local treatment for chronic cystitis followed; namely, irrigation with antiseptic solutions, especially in conjunction with gradual hydrostatic distension of the bladder. Vaccine treatment must always be employed, and every other means adopted to improve the general health of the patient.

(2) Cystitis dependent on the genital organs, or associated with infections thereof.—The disease may be acute or chronic. When associated with infections of the genital passages it is usually at first acute, but should it continue, may subsequently become chronic. Cystitis dependent on disease of the genital organs is, however, generally chronic, and it may safely be said that this form of cystitis, which we shall consider last, is one of the commonest in women.

Associated infection of the bladder is usually due either to the gonococcus, bacillus coli communis, streptococcus or staphylococcus.

Gonococcal infection of the bladder—apart from urethritis—is not a common affection in women. This condition is best treated by injecting into the bladder a small quantity of silver nitrate solution (0·2 per cent.) or argyrol (1 to 5 per cent.) twice a day, and administering sandal-wood oil, cubebs or copaiba internally.

When due to concurrent *septic infection*, especially during the puerperium, the cystitis must be treated on the lines already laid down in regard to direct infection *viâ* the urethra.

In the majority of cases in which the cystitis is chronic there are

abnormal conditions in connexion with the genital organs which give rise to the trouble in the bladder.

First, of course, we have the *effects of pregnancy*. In normal circumstances the pregnant woman, during the early months, usually suffers from some bladder irritation, owing to the pressure of the enlarging anteflexed uterus on the bladder. There may or may not be actual cystitis. If the patient be in ill health then the interference with the bladder may be sufficient to reduce still further the already reduced resistance, and allow that viscus to become infected on the principle that any injured organ is open to attack. Or, again, when there is retroversion and flexion of the gravid uterus the bladder frequently becomes overdistended from the patient's inability to overcome the obstruction and to pass her urine. This overdistension and the presence of residual urine are factors of great importance conducing to the onset of cystitis.

In addition to the cystitis which may be caused during the term of pregnancy we must consider the direct mechanical effects of parturition upon the bladder. Should the head be impacted in the pelvis for an undue length of time the base of the bladder may be seriously bruised and even temporary obstruction to the passage of urine occur. These troubles can, of course, to a large extent be guarded against by a skilful obstetrician, but in many cases injury to the bladder is unavoidable. The damage may amount to mere bruising, which, however, may be enough to conduce to subsequent cystitis—of itself, or from subsequent retention of urine; or a more serious state of affairs may arise should the pressure on the bladder result in sloughing, with the formation of a urinary fistula. In such circumstances some degree of bladder infection almost invariably follows.

The treatment of cystitis associated with pregnancy and parturition is largely prophylactic. The retroversion must be prevented, irritation by the anteflexed uterus combated by rest on the back, and the dangers of parturition mitigated by skilful obstetrics. A continued chronic cystitis must be treated on the lines already laid down.

Apart from pregnancy and parturition there are pathological conditions which may lead to cystitis in a similar way—that is to say, by mechanical obstruction or irritation. *Fibromyomatous tumours of the uterus* or *ovarian tumours* may press on or occasionally come in contact with the fundus of the bladder; or by filling the pelvis force the bladder up into the abdomen, and lead to obstruction with, possibly, subsequent atony of the bladder wall from overdistention. In the pathological conditions mentioned the cause must be removed, and the cystitis subsequently treated by mild antiseptic irrigation, and urotropine administered internally.

A far more serious state of affairs, however, is that which is brought about by direct extension of disease from the uterus or other genital organs. Thus *infections of the uterus, tubes* or *ovaries* may lead to direct infection of the bladder by continuity of structure. Abscesses in connexion with the genital organs may burst into the bladder, and so lead to direct internal septic fistula.

Or, again, *malignant disease of the uterus* very frequently makes its way towards the bladder and gives rise to cystitis long before the mucous membrane is actually invaded and possibly a fistula formed.

In all such cases the treatment is primarily connected with the treatment of the associated conditions in the genital organs. In the case of cancerous invasion nothing can be done to relieve the patient beyond most careful nursing.

Movable kidney occurs in a very large percentage of all women examined. Some authorities place this as high as 20 per cent. The differences of opinion that have been expressed as to the frequency of occurrence seem to be based on the different standpoint taken in regard to the mobility. That is to say, no notice is taken by some of the 'loose' kidney, and it is only when the kidney is freely movable that any abnormality is considered to be present.

Normally the kidney moves slightly on respiration. Any excessive mobility should be considered abnormal.

On page 101 the method of abdominal palpation of the kidney is described. If on examination the lower pole of the kidney be found lower than normal (see fig. 81, p. 99) the kidney is either enlarged, movable or both. If definite movement can be obtained while the patient is holding her breath the kidney may be considered 'loose,' sometimes it is freely movable; at other times it may be found quite free ('floating') with a definite mesentery.

Loose or movable kidney is much commoner on the right than on the left side. The condition is found in unmarried women as well as in multiparae. The patient is often thin and neurotic. It has been pointed out that this condition is frequently associated with enteroptosis and with dilatation of the caecum. Now in a very large number of cases no symptoms are caused, and *in these circumstances the patient should never be informed that there is anything the matter with the kidney*—to do so is to give a neurotic woman a peg on which to hang her ailments. Only when there are definite symptoms, such as acute attacks of pain and vomiting (Dietl's crises) associated with periodic enlargements of the kidney and followed by a copious flow of urine, denoting kinking and subsequent straightening of the ureter; or stomach dilatation from the dragging down of the duodenum; or other definite signs of physical disability such as aching pain on walking

which is relieved by rest in bed—only in these circumstances is an operation for the fixation of the kidney (nephropexy) to be advised.

Neurasthenia does not arise from the ordinary slight mobility often found, and therefore operation does not improve matters in these cases—in spite of the assertions of those who trace many cases of insanity in women to the presence of loose kidneys.

Neurasthenia may however be aggravated, and a cure be prevented, by a movable kidney associated with actual physical discomforts. In such cases, of course, an operation may be justifiable, but it is always advisable first to try the effect of a kidney belt and pad, such as that recommended by Treves.[1] If this relieve *all* symptoms, and the patient object to wearing a belt permanently, then the kidney may be fixed in position with confidence.

COCCYDYNIA.—This is the term used to denote pain in the region of the coccyx. There are two varieties:

(1) That which occurs in young, so-called 'neurotic,' nulliparous women.

(2) That seen in parous women who have suffered injury to the coccyx during parturition; or in women in whom the coccyx has been injured by a fall or blow.

In the first class of case there is severe pain of a neuralgic type. Sometimes this is said to be worse on walking; in other cases it is worse on sitting down.

In these cases there is little or no pain on defaecation, or on pressure over the coccyx—indeed, on grasping and moving the coccyx between one finger in the rectum and one outside no increase of pain is complained of.

It is very difficult to treat these patients. In some there is a retroverted uterus, but the practitioner must not be deluded into promising relief by curing this displacement, which is frequently found in young women of the neurotic type and is symptomless in itself.

The parts should be blistered with the actual cautery and the patient treated on general lines.

In the second class where fracture, dislocation or other serious injury to the coccyx has been produced *there is great pain on defaecation,* and on sitting down. The pain is made worse by pressure or by the movement of the coccyx in the manner described above.

If rest in bed do not cure the trouble in a reasonable time, the coccyx must be excised. This is quite a simple operation.

[1] Manufactured by Ernst.

AFFECTIONS OF THE LARGE INTESTINE. Haemorrhoids.—The gynaecologist and practitioner are frequently called upon to advise in regard to 'piles.' These are generally seen in multiparae and may give considerable trouble during pregnancy. If, when parturition is over, there be still considerable discomfort the haemorrhoids should be removed by operation; either by excision and suture, by ligation, or by clamping and burning. The last method is considered old-fashioned, but it is nevertheless speedy and effectual.

Appendicitis and sigmoiditis in their relation to the genital organs have been discussed in Chapter X.

Chronic constipation, which is often associated with the results of colitis or may actually lead to that condition, is so common in women that no consideration of gynaecology would be complete without some reference to it. The causal factors that make constipation so much commoner in women than men are very hard to estimate, but there is little doubt that in a large proportion of cases the condition is brought about by the failure of the patients to establish a daily habit, such as is usual with most men. Women, also, have far larger calls with menstruation, pregnancy and lactation, upon their calcium economy, which is largely concerned in maintaining the proper tone of the intestinal muscles. One generally finds the patient has been content to go on taking aperients until she reaches the condition in which there is never a normal action. There is no doubt that the abuse of aperients is a contributory factor in the continuance of constipation.

Again, we frequently find that the rectum is loaded with hard faeces. Now this is of much importance clinically, for it indicates that the normal factors which lead to the act of defaecation are no longer operative. Defaecation is induced normally by the stimulus of faecal collections on the mucous membrane of the rectum. In women suffering from chronic constipation the constant contact of the faeces with the rectum abolishes the sensitiveness of the mucous membrane, and with it the desire to defaecate.

At this stage of the disorder another effect arises, namely, spasm of the sphincter muscle, which leads ultimately to what may be called a 'contracted sphincter'—a condition favouring the retention of faeces.

Now chronic constipation leads to many evil results, and these are in effect local and general. The general symptoms, the result of what is known as copraemia, only concern us indirectly, and it is unnecessary to do more than mention the fact that this form of toxaemia is productive of headache, lassitude, anaemia and 'indigestion.'

Locally, however, there are lesions and symptoms which demand our close attention owing to the proximity of the genital organs.

We have already dealt with appendicitis and sigmoiditis, so

that now we shall only consider the more chronic changes in the lower part of the descending colon, the sigmoid and rectum which arise as the direct result of constipation.

In the bowel diverticula may form, into which faecal material makes its way; this may bring about abscess formation in the neighbourhood, or lead to the formation of little hard grape-like projections from the bowel which may be felt *per rectum*, or *per vaginam*. In time, too, infective processes spread through the wall of the bowel and give rise to local peritonitis with adhesions. These adhesions not uncommonly involve the left Fallopian tube and ovary. Or again, the ever laden sigmoid may obstruct the circulation through the left ovarian vein, with the result that a varicocele is formed on that side. Now the chief symptom produced by all these conditions is left-sided pain. This is so whether the condition be one of chronic constipation alone, or with varicocele or infective extension through the bowel wall.

In most cases it is difficult to say whether definite lesions have been produced outside the bowel or not, yet successful treatment depends largely on this question.

Treatment.—This must be carried out thoroughly, and is both medical and surgical. It may, however, be said at once that no surgical interference is justifiable until the immediate condition of overloaded bowel is relieved—unless, of course, that relief necessarily depends upon surgical intervention. The diet should be regulated on the ordinary accepted lines. Purgatives must be given up, and instead, an olive oil enema should be administered daily and the bowel washed out with a long tube afterwards. The lavage fluid, which is run in with the pelvis raised, should consist of ordinary saline solution. Before lavage is employed it is often useful thoroughly to stretch the sphincter, under anaesthesia. This is a small operation which rarely has to be repeated.

The patient should also be directed to drink one ounce of olive oil three times a day after meals.

Massage, Swedish exercises and electricity are valuable adjuncts to the general treatment. Some cases, however, are of such long standing and are associated with such dense adhesions round the colon that nothing short of an ileo-sigmoidostomy (anastomosis between the ileum, divided low down, and the lower portion of the sigmoid) is effectual. This operation, however, falls within the province of the general surgeon, and is one that requires judgement and experience, and should only be employed when the colon is contracted.

With a dilated and atonic colon, unaffected by medicinal remedies and general treatment, the operation of appendicostomy, in which the appendix is brought to the surface and used as a channel by which

a catheter can be passed and the colon flushed out daily, is employed by the general surgeon with considerable advantage; and often, like ileo-sigmoidostomy, with permanent benefit in suitable cases.

In regard to the local lesions of the genital organs. When the tube and ovary are found bound down by adhesions, or the bowel is found adherent in the pelvis, all adhesions should be carefully separated and if possible the raw surfaces sewn in. When a varicocele is present the ovarian vein should be ligated between the uterus and pelvic wall, and excised. There is no doubt that many women would be relieved of their left-sided pain if this simple operation were more frequently performed; and that many of their general symptoms, stigmatized as 'neurotic,' would disappear, although no doubt the cure of the chronic constipation would play a large part in this result.

Cancer of the large intestine is not infrequently met with in conjunction with pelvic tumours; and previously innocent ovarian cysts may become malignant by invasion from the neighbouring growth (fig. 279).

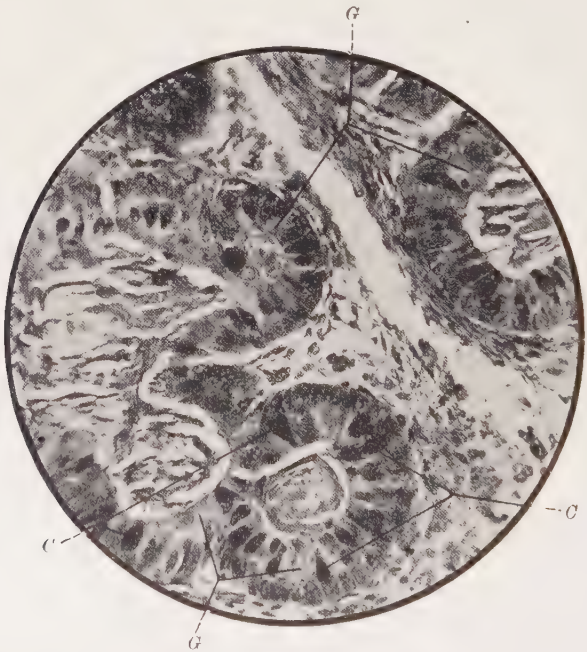


Fig. 279.—Adenocarcinoma of an ovarian cyst secondary to carcinoma of the rectum. ×220. (*Photomicrograph.*)

G. Adenocarcinomatous glands. *C*. Large 'goblet' cells

TUBERCULOUS PERITONITIS may arise from tuberculosis of the genital tract, but it is often found independent of, or as the causal

factor in, tuberculosis in the genital system. In any case it is a common pathological condition which of itself presents many points of interest to the gynaecologist.

The disease is generally found in young women. It often occurs in childhood and, although recovery is complete as regards the disease itself, pelvic adhesions may be formed, and lead to trouble which is not discovered until puberty.

Etiology and **pathology.**—In some cases the disease may originate in the Fallopian tubes; in others in the appendix. In most, however, the primary lesion appears to be in the peritoneum or mesenteric glands, and in these cases the infection arises from the bowel. The lesions are produced by the tubercle bacillus, and the microscopical findings are similar to those usually associated with tuberculous disease, but the gross lesions vary very much in character. In the *acute cases* the whole peritoneum is studded with miliary tubercles,—like small, white pimples—scattered all over the dark-red, congested serous membrane. In this type there is usually a large quantity of straw-coloured ascitic fluid. In the *subacute cases* dense adhesions may form with the accumulation of very little fluid; and large collections of pus, from suppuration in the glands, may also be found. Sometimes, however, the collections of fluid are isolated, and form cyst-like tumours, the diagnosis of which may be a difficult matter. As a rule the conformation of these 'tumours' changes, so that if the case be watched for any length of time this feature may give an indication of the nature of the disease.

Symptoms and **diagnosis.**—The symptoms are very variable, although pain in some form or another is an almost constant feature. Rapid enlargement of the abdomen due to ascitic fluid in a young woman is very suggestive, and a pelvic examination may lead to the discovery of enlarged and adherent tubes. This disease may be confused with salpingitis from gonococcal infection or even with cancer of the parts.

When the condition is in a chronic form the patient suffers from 'indigestion' and severe attacks of pain which are usually worse at the menstrual periods. If there be no fluid, and the disease be primary in the peritoneum, the diagnosis is difficult unless masses of thickened omentum, which are very characteristic, can be felt through the abdominal wall. The chronic variety with localized cysts has to be diagnosed from the various abdominal tumours, and particularly from ovarian cysts. This question has already been dealt with, when discussing those growths.

The tuberculin skin reaction of von Pirquet may be used to confirm or negative the diagnosis, but it is not yet certain whether this test

be really quite reliable, in fact most authorities consider that only a negative result is of any value. The Calmette eye reaction for tuberculosis is too dangerous to be used generally.

Treatment.—This is discussed to a great extent under tuberculosis of the Fallopian tubes. It only remains to say that tuberculous peritonitis with ascitic fluid is often cured by simple laparotomy and evacuation of the fluid. No drainage should be employed. The dry, chronic variety is sometimes best treated by laparotomy, but is not nearly so amenable to this line of treatment unless the primary focus be not in the peritoneum, and can be removed.

SKIN DISEASES.—The vulva is liable to be affected by any of the ordinary skin lesions. The condition found may be limited to the vulva or be part of a general distribution of the disease in question.

When the lesion is general it can hardly fall within the province of the gynaecologist—unless of course the condition be part of a genital infection, such as syphilis. If, however, the skin lesion be confined to the vulva it is probable that the gynaecologist will be consulted, or the general practitioner called upon to recognize a condition which the patient may believe to be of special import—attaching more significance to the position of the lesion than to the disease itself.

The following are the most important of the ordinary skin diseases which may occur as exclusive affections of the vulva.

Herpes.—This is a vesicular eruption in which the vesicles form in scattered groups. These may subsequently become confluent with the formation of bullae. The eruption, just as when it occurs elsewhere on the body, is dependent upon some lesion connected with the superficial sensory nerves of the part, and may therefore cause pain. The disease runs a definite course of about a fortnight.

Treatment.—The area affected should be kept very dry with a dusting powder of calamine and starch.

Eczema.—Eczema of the vulva is not uncommon. The milder cases, due to want of cleanliness or to intertrigo, give rise to irritability and discomfort which require attention before the parts become damaged by scratching. As a rule rest and cleanliness are all that is required in the way of treatment.

In the severer cases, however, in which there is often an underlying constitutional factor such as gout or diabetes, the patient is unable to avoid scratching herself. This leads to surface abrasions which may become encrusted with discharge. Great care must be taken not to confuse such a condition with venereal vulvitis.

Treatment.—The constitutional disease, if there be one, should be treated, and the local lesions managed on ordinary lines.

When the parts are dry an ointment such as the following is useful.

℞. Bismuthi Subnitratis - ℥ j
Lanolin - - - - ℥ j

If the parts be encrusted and moist they should be first cleansed with a solution of sodium bicarbonate and afterwards kept dry with a dusting powder of calamine and starch.

Leucoplakia.—This skin disease is of some importance on the vulva, just as it is on the tongue, for it may be followed by cancer of the parts affected. It is probably not syphilitic in origin as was previously thought. Any part of the vulva—external to the inner surfaces of the labia minora—may be involved and the adjacent skin may also be affected.

In appearance the parts at first are red, swollen and dry; later they shrivel and become hard and white; eventually, when the disease has reached the last stage—which may pass on to carcinoma—the affected areas are cracked and ulcerated.

Symptoms. — The most important and noticeable symptom is pruritus vulvae. This is worst in the early stages; later, pain is not uncommon.

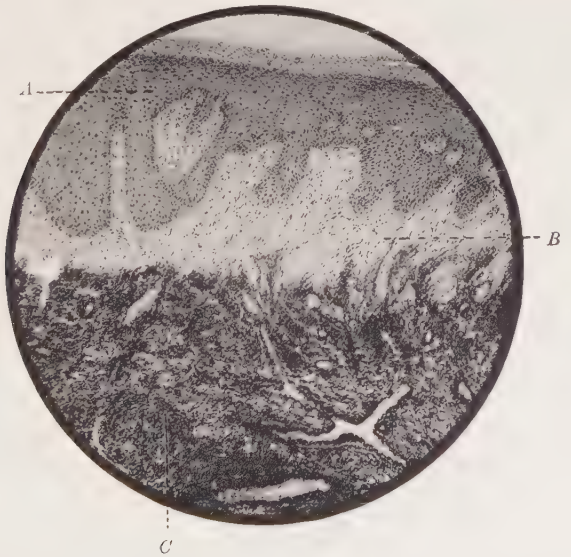


Fig. 280.—Leucoplakia of the vulva. This section illustrates the second stage, before fibrosis in the subepithelial tissue leads to superficial keratinization with shrinkage. (*Photomicrograph, Berkeley and Bonney.*)

A. Hypertrophied epithelium with excessive superficial desquamation, and elongated papillary processes. *B*. Subepithelial tissue which is hyaline in appearance. *C*. A new lymph node formed among the elastic fibres of the connective tissue.

Leucoplakia is found on microscopical examination to be first of all associated with a considerable thickening of the epithelial surface (fig. 280); eventually fibrosis of the subepithelial connective tissue cuts off the blood supply and leads to a condition of keratinization of the surface cells.

The **treatment** consists of applications of the X-rays. Should these fail to give complete relief the parts must be excised.

CHAPTER XV.

THE PREPARATIONS FOR OPERATION, AND THE SUBSEQUENT MANAGEMENT OF THE CASE.

It is impossible for any surgeon to deal with the important questions which come under this heading in any but a partial manner, for all surgeons have their own particular methods which they like to see carried out. At the same time it is of the greatest importance to students and practitioners to have a concise idea as to what is necessary in the present day for the proper performance of an operation, and of the essential details of the subsequent management, for which the ordinary medical attendant is largely responsible in private practice, and in which, sometimes, he may feel that he is not particularly well versed, so great have been the changes in recent years.

Gynaecological operations fall naturally into two large groups, those which are carried out by the abdominal route and those by the vaginal; and it will be necessary to consider them separately. Before dealing specifically with each it will be well to allude to what concerns any operation, abdominal or vaginal.

In the present day most private operations are performed in nursing homes where everything can be conducted as in hospital. Sometimes, however, removal of the patient is inadvisable, and at other times she insists on remaining at home.

When an operation is to be carried out in a private house there is generally a considerable commotion, so that the medical attendant is first faced with 'the family.' If he be a wise man he will at once endeavour to reduce the number of those staying in the house to a minimum, both for his own peace of mind and for the benefit of his patient.

§ i. CHOICE AND PREPARATION OF THE ROOM.

The medical attendant is called upon to select the room for the operation, and the room in which the patient will subsequently be placed. If the house be a large one it is advisable to have these rooms separate, in order that the patient may not 'wake up' in an anaesthetic laden atmosphere. For the operation room it is well to select a large dressing room, which can be thoroughly warmed; this should be connected with a bedroom for the patient to occupy after operation. It is convenient, too, during the after-treatment for the nurses to have the use of the dressing room in which to keep all their accessories. A uniform light is an important matter, so when possible a room with a North aspect should be chosen.

In a small house the after-treatment of the patient may have to be carried out in the operation room. In this case the patient must sleep in another room before the operation.

The room having been decided upon, if there be time all light furniture, carpets, pictures and hangings should be taken out of it, all dust removed and the floor thoroughly scrubbed. This must be done at least two days before operation. If there be no time for this a clean sheet should be laid on the carpet, and everything else left untouched in order to avoid disturbing any dust there may be. When possible a fire should be lighted in the room, the temperature of which should be between 70° F. and 75° F.

§ ii. REQUISITES TO BE PREPARED BY THE NURSE.

The nurse should see that the following requisites for the operation are prepared ready:—

(1) Two basins, containing hot sterile water.
(2) A large bowl, containing one pint of a 75 per cent. solution of methylated spirit in water.
(3) A large bowl, containing two pints of 1–500 aqueous solution of biniodide of mercury.
(4) Four nail brushes boiled and afterwards placed in a 1–1000 aqueous solution of biniodide of mercury.

} For the purification of the surgeons' hands.

(5) A small bowl, containing 1–1000 aqueous solution of biniodide of mercury, to swab over the abdomen, or purify the vagina, prior to operation.

(6) A large basin, half full of cold sterilized water, for the gloves.

(7) Several large ordinary bedroom jugs containing cold as well as hot sterile water *(i.e. water which has been at boiling point for at least ten minutes; it is* **not** *sufficient merely to bring the water to boiling point).*

N.B.—All bowls and jugs must be previously sterilized, preferably by boiling, or, if this be impracticable, by burning out with ignited methylated spirit after having been carefully cleaned. They must then be covered with sterilized towels, or inverted upon a table covered with a sterilized towel, until required for use.

(8) A dozen (if possible) cloths, or small towels, sterilized, in two parcels. That is to say, two bundles of six small towels or cloths are enclosed and sewn in another cloth or towel and then boiled for ten minutes, being dried subsequently—still enclosed in the outer covering—in the oven, after being placed in a bowl.

One lot of the towels is for the nurse to cover the bowls and jugs with, or to cover the table upon which these articles have been inverted. The other half-dozen are not to be opened, but reserved for the surgeon's use in case he should require them.

(9) For an abdominal operation two six-inch bandages and a binder; and for a vaginal a T-bandage.

(10) Three small tables, three feet square or thereabouts, and on four (*not three*) legs; one for the operator's instruments, another to stand by the assistant for the dab tins, and the third for the anaesthetist's bottles and instruments.

(11) A small footpan to place underneath the foot end of the table, if the operation be a vaginal one.

These directions may be varied to suit the requirements of the individual surgeon in regard to the lotions used for the purification of the hands.

§ iii. GENERAL PREPARATION OF THE PATIENT FOR OPERATION.

All patients, when possible, should remain in bed under the charge of a nurse for forty-eight hours before the operation. If the patient be very debilitated, or the operation expected to be of great severity, a much longer period of preparation may be necessary.

The bowels should be kept acting daily for the previous week, and in the case of an abdominal section a copious enema should be given on the evening before operation, after which no solid food should be given, although the patient may be allowed water, tea, or similar fluids in small quantities to within three hours of the operation. If the operation be a vaginal one the enema should be given on the morning of, and not the night before, the operation. The diet the day before operation should be soft and easily digestible, and contain plenty of fluid. The patient should be encouraged to drink freely, as there is often a great loss of fluid and consequent fall of blood pressure during and after an operation.

The state of the mouth and teeth must be very carefully attended to, and all sources of oral sepsis removed as far as possible. This may involve the removal of decayed teeth. An antiseptic mouth wash and tooth powder should always be employed.

If the patient be very nervous bromidia (ʒij), or some similar preparation, should be given by the mouth the night before operation, to insure sleep.

The patient's body should be well wrapped in wool or woollen garments during, and for some time after, operation, until all danger of shock supervening has passed.

The urine must be drawn off with a catheter immediately before the patient is anaesthetized, and the vulva thoroughly cleansed afterwards with an aqueous solution (1–500) of biniodide of mercury.

Ten minutes before the administration of the anaesthetic is commenced $\frac{1}{100}$ gr. to $\frac{1}{50}$ gr. atropine sulphate should be injected hypodermically, to prevent salivation and to raise the blood pressure. Atropine has the further advantage of checking the inhibitory stimuli from peripheral irritation conveyed to the heart *viâ* the vagus.

Prevention of traumatic palsies. There is one more point in regard to the patient which must be mentioned here, and that is the prevention of paralyses of the arm from compression of the musculo-spiral or other brachial nerves against the edge of the operation table. There is nothing more annoying to the surgeon or the nurse, not to mention the patient, than these paralyses after a successful operation—unless it be the burn of a hot bottle. They are always due to carelessness. The braces shown in figure 281 may be used to prevent this mishap. They are simple and efficient; and, if the use of them be explained to the patient, she will always allow them to be adjusted before the administration of the anaesthetic; if, however, she should object, they can be put on when she is unconscious. This appliance keeps the arms from moving from the side,

and the hands from leaving the chest, without compressing the thorax or interfering in any way with respiration. The method of adjustment can be seen from the illustration.

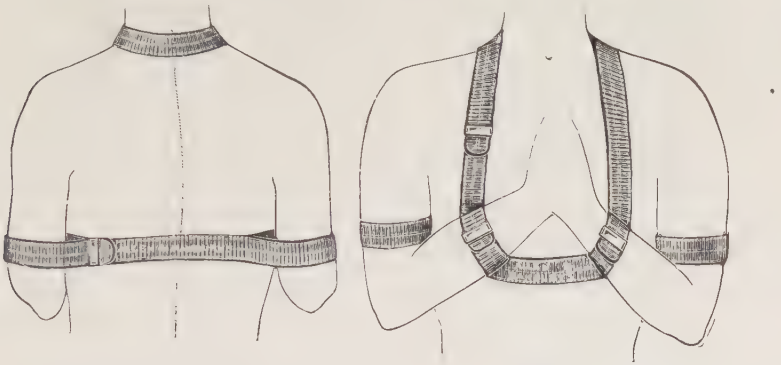


Fig. 281.—Author's operation braces.

§ iv. ANAESTHESIA.

In regard to the anaesthetic, recent research has shown that ether is indubitably the safest anaesthetic for routine operative work. If the case be a septic one it is almost criminal to use chloroform in the light of our present knowledge concerning the frequency with which severe acidosis—so often fatal—follows the administration of this anaesthetic in such cases. This is hardly the place to discuss the relative merits of the two drugs, but there is little doubt that the recent introduction of the *open method* of giving ether has given a great impetus to the use of this safe anaesthetic among general practitioners, who, for the most part, avoided it previously owing to the cumbrous methods which were employed in the administration. A short description of this method may, therefore, not be out of place.

Open method of ether administration.—A piece of absorbent gauze several layers thick, wrung out of cold water, is laid over the closed eyes of the patient. A large square or oval of gamgee tissue, with a triangular hole cut out for the nose and mouth (fig. 282), is then laid over the whole face, and the patient instructed to breathe quietly. This method of covering the eyes and face—besides having other advantages—is very soothing to the patient. An ordinary Schimmelbusch's chloroform mask, covered with several layers of gauze, or, better, 'stockingette' material, is next laid over the nose and mouth aperture (fig. 283). Ether is then dropped uniformly over the surface

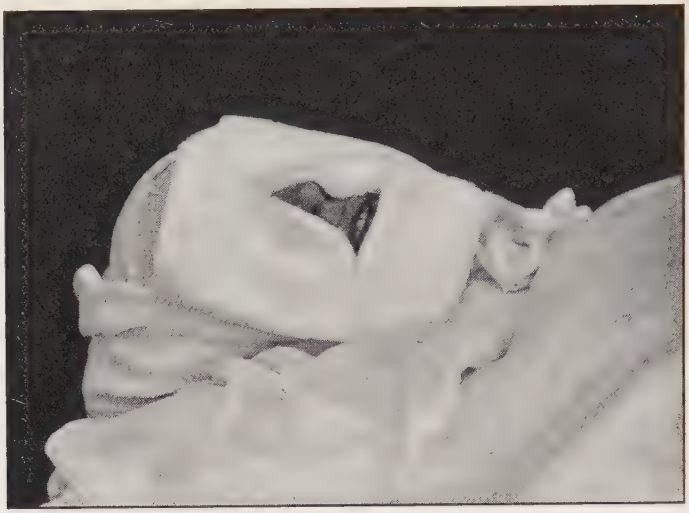


Fig. 282.—The open method of administering ether, showing the gamgee tissue face covering with the triangular slit-opening for the nose and mouth.

of the mask at the rate of about two drops a second to commence with. This dropping is carried out from a drop-bottle, or from an ordinary bottle with a cork that has been grooved on each side, into one of which grooves a gauze wick has been placed. If the patient do

Fig. 283.—The open method of administering ether, showing Schimmelbusch's mask, on which two pieces of folded gauze have been laid, in position on the gamgee face covering. The ether bottle with its gauze wick is also seen.

not appear to be 'going off' quickly enough, the mask is covered with a few additional layers of gauze, and the rate of dropping slightly increased. Very little practice is required to attain proficiency; indeed major abdominal operations have been performed during which the medical attendant has given the anaesthetic by this method for the first time without the least difficulty, and without having seen it so administered. The patients usually go quietly off to sleep. The eyes are never touched, and the administrator judges the depth of anaesthesia by the respirations and the muscular relaxation. The quantity of anaesthetic can be decreased as the operation proceeds, and when the patient has been under its influence for a considerable time. More or less continuous administration, however, is necessary for some time. The advocates of chloroform urge the frequency of bronchitis and lung complications after the administration of ether. This, however, is not to be feared in those without previous lung trouble if the operation room and bedroom be warm, the patient well wrapped up, and atropine previously administered.

§ v. THE PREPARATION OF THE PATIENT FOR AN ABDOMINAL OPERATION AND HER AFTER-TREATMENT.

The following points have reference to the preparation of the patient for, and the after-treatment of, an abdominal section in which the bowel is undamaged and the case pursues a normal course. These directions are, of course, to be taken in conjunction with what has been said already in regard to the details of general management.

Preparation of the patient. **Local.**—After the patient has had a hot bath on the night before the operation the pubes and abdomen should be well shaved, and the whole of the front of the abdomen (and in certain cases the lumbar region) should be thoroughly washed with soap and water, then swabbed with ether, and finally with a lotion of 1–500 biniodide of mercury in 75 per cent. spirit solution. A dry sterile dressing is then placed over the purified part.

In the morning, two hours before operation, this should be replaced by a dressing soaked in a 1–2000 biniodide of mercury aqueous solution, and covered with a piece of jaconet.

If the case be an emergency one the abdomen should be *dry-shaved*, and then painted with a 5 per cent. solution of iodine in rectified spirit. This is repeated just before the operation, and again after it, before the wound is covered with dressings. The surface to be painted *must not be washed* in any way unless this can be done

twelve hours previously, otherwise the action of the iodine is to some extent prevented.

The vagina should be douched with two pints of a 1–3000 aqueous solution of biniodide of mercury at a temperature of 110° F. every four hours during the day before operation and on the morning of the operation.

After-treatment.—As soon as the patient is put into bed after a 'clean' operation (the hot bottles being removed until consciousness is restored) the foot end of the bed should be raised about six inches on wooden blocks, books, or some similar contrivance—this is especially necessary when she has been operated upon in the Trendelenburg position—and one pint of warm normal saline solution run into the rectum through a number 10 male catheter attached to a funnel by a tube. This saline infusion is repeated every four hours for the first twenty-four, then every six hours for the second twenty-four, and twice in the third twenty-four hours. After the first administration a soft rubber rectal tube should be gently inserted high into the rectum and left *in situ* for the half hour preceding each saline administration, in order to facilitate the escape of gas.

The patient is put back to bed on her back, but she may at any time be turned into other positions, for it will be found that she rests and sleeps better if moved on to the side and not kept too long in one position. As soon as it is certain that no degree of shock is likely to supervene the blocks should be removed from the foot end of the bed, and after a few hours the head end should be raised, or the patient may be slightly propped up. This often prevents vomiting.

Restlessness during the first evening should be treated by the administration of three drachms of bromidia in one of the salines by the rectum. Morphine should not be given, if it can be avoided—a small dose ($\frac{1}{6}$ gr.) may, however, be necessary to relieve pain.

The patient should be allowed to pass her urine naturally, if possible; if not the catheter must be passed every eight hours.

On the second evening calomel, in three one-grain doses, mixed with sodium bicarbonate, should be administered with hourly intervals. A turpentine enema should be given early the following morning, and repeated if necessary.

Nourishment.—Twelve hours after operation an ounce or two of fluid nourishment may be taken hourly if the patient be not vomiting. This should consist of albumin water (the white of two eggs to a pint of water, with two drachms of brandy and a little salt) and glucose solution (made by stewing one part of sultana raisins cut in pieces with two parts of water for three hours; this is then strained and diluted with an equal quantity of water, to which *plenty* of lemon juice has

been added). Weak China tea may also be given. Later the quantity and variety of the nourishment, and the length of the intervals between each feed, may be gradually increased.

If there be any stitches to be removed an antiseptic compress (1–3000 biniodide of mercury) covered with jaconet should be placed on the wound three hours previously, and the part washed with a 1–500 spirit solution of biniodide of mercury immediately before the removal, in order to prevent infection and late suppuration from the removal of superficially infected sutures.

In ordinary cases the patient may be allowed out of bed between the fourteenth and seventeenth day.

§ vi. THE PREPARATION OF THE PATIENT FOR A VAGINAL OPERATION, AND HER AFTER-TREATMENT.

The following points have reference to the special management of uncomplicated vaginal operation cases.

Preparation of the patient. **Local.**—The vagina should be irrigated every four hours during the day before the operation with two pints of a 1–3000 aqueous solution of biniodide of mercury; this should be repeated after the enema, given on the morning of the operation, has acted. The patient should have a hot bath on the evening before the day of operation.

On the night before the operation the pubes and vulva should be well shaved, and thoroughly washed with soap and water, then well swabbed over with a 1–500 aqueous solution of biniodide of mercury. Afterwards a cyanide of mercury gauze dressing should be kept on the part with a T-shaped bandage, the urine being drawn off with a glass catheter which has been sterilized by boiling, and the vulva subsequently recleansed.

After-treatment.—All hot bottles must be removed from the bed until the patient recovers consciousness.

No nourishment should be given by the mouth for six hours. Then for the next twelve hours albumin water (*v. supra*) or 'raisin tea' (*v. supra*) may be given—an ounce or two every hour. Weak China tea may also be allowed.

After the operation the patient should be encouraged to pass urine naturally, being cleansed afterwards. A bed-pan should be used for ten days.

When only a curetting of the endometrium or repair of cervix has been done, the food may be rapidly increased, and the bowels opened

on the third day by means of calomel administered on the second evening and an enema on the following morning.

If, however, the operation have consisted of a vaginal or perineal repair the patient must be kept on fluids for a week at least. The bowels should be made to act on the third day, when six ounces of warm olive oil should be run gently into the rectum to soften the faeces, and one-sixth of a grain of calomel given every hour until the bowels act, or the patient has had four grains. If this be ineffectual an enema must then be *gently* given.

All vaginal and uterine packs must be removed 24 hours after operation.

After all vaginal operations the passage should be irrigated once on the following day to wash out blood clots which may have collected in it; and subsequently irrigation should be carried out twice daily with two pints of 1–3000 aqueous solution of biniodide of mercury at a temperature of 110° F., commencing on the third day. A douche can and a 'return tube' irrigator should be employed. The whole apparatus must be boiled each time before being used. Great care must be taken both in irrigating and in giving enemata lest any strain be put on the sutured part. In cases of vaginal hysterectomy some alteration in these directions may be necessary.

The vulva should be kept dry with boric acid and iodoform powder (equal parts), or with xeroform powder.

When there has been repair of the vaginal walls or vulval orifice the knees must be fixed together until the patient has recovered consciousness after the operation.

The patient should not be allowed out of bed for two weeks at least, except in the case of a simple curetting or cervical repair when it will suffice if the patient be kept in bed for four or five days after operation.

§ vii. POSTOPERATIVE COMPLICATIONS AND THEIR MANAGEMENT.

It will be necessary now to consider some of the complications which may arise after operation, and how these can best be met and dealt with. They may be due to the anaesthetic, to the operation, or be dependent on the condition of the patient before operation.

Postanaesthetic complications are common to any operation, whether abdominal or vaginal, and may be connected with the general condition of the patient in regard to shock, sepsis, pulmonary or constitutional derangements. It will be best, therefore, to consider

first of all those complications arising from the anaesthetic and from general disturbances, and afterwards those which are specially connected with the region of the operation.

COMPLICATIONS WHICH MAY OCCUR AFTER ANY GYNAECOLOGICAL OPERATION. Postanaesthetic vomiting.—When vomiting comes on as soon as the patient begins to recover consciousness it is nearly always due to the anaesthetic. If ether be given by the closed method, and without the previous administration of atropine, there is usually a copious secretion from the salivary glands and mucous glands of the air passages; this secretion becomes saturated with ether, and is swallowed into the stomach, causing vomiting from *local irritation* quite apart from any toxaemia which may be produced by the anaesthetic. Hence vomiting should be guarded against by using the open method of administration, and by injecting atropine beforehand.

The **treatment** for 'anaesthetic vomiting' is to give the patient half a pint of hot water to drink. This will be immediately rejected, and the stomach washed out in the process. It is quite unnecessary to use a stomach tube. If the patient should have had an anaesthetic at some previous time, and say that she vomited badly afterwards, it is better not to presume that the proper precautions were not taken (although such may have been the case), but rather to consider that the patient has an adverse idiosyncrasy to anaesthetics, as oftens happens. In these circumstances she should be allowed while 'coming to' to inhale warmed oxygen freely, by means of an inverted funnel attached to an oxygen cylinder and warming apparatus, such as a bottle containing hot water through which the oxygen is allowed to bubble. This often gives satisfactory results. Nothing should be given by the mouth so long as there is any vomiting. As already stated, the patient's head and shoulders should always be raised as soon as any condition of shock has passed off.

In spite of all precautions the 'anaesthetic vomiting' may be severe, and even the washing out of the stomach, described above, may give no relief. In these cases the cause probably lies in a *general toxaemia (acidosis)*, and not in actual stomach irritation. The best method of treatment in these circumstances is by continuous rectal salines, which encourage a copious diuresis. While this is being carried out a heavy and hot linseed poultice with mustard may be applied over the epigastrium. Turpentine, iodine and other counter irritants have been advised for internal administration, but for the reasons given are of little use in bad toxaemic cases. Fortunately these severe cases of vomiting are now extremely rare—so rare that

they can probably be entirely avoided if the precautions mentioned be taken.

There are, however, other cases in which the vomiting is a very serious symptom of some local trouble or general septic toxaemia. As these, however, hardly ever occur except after abdominal operations they will be discussed later (p. 432).

Chest complications.—In spite of every care there are some patients, tuberculous or otherwise susceptible, who develop chest lesions after operation. There is no doubt that some of these have no direct reference to the anaesthetic; at the same time ether bronchitis and broncho-pneumonia do occasionally occur. A careful watch should therefore be kept upon the respiration. If the rate increase, and the patient commence coughing, a large dose ($\frac{1}{75}$ gr.) of atropine should be given hypodermically twice a day, and the salines discontinued. By this means the irritation may be allayed, the secretion checked and the attack aborted. Should, however, the symptoms continue, stimulant expectorants such as ammonium carbonate should be given as well as the atropine, and the case treated on ordinary medical lines. It is important in these cases to prop up the patient in bed.

Cystitis may follow vaginal and abdominal operations, more especially hysterectomies; consequently the urine should be examined regularly, and if any signs of cystitis appear the bladder must be washed out daily, and urotropine (gr. v) administered three times a day by the mouth.

Enema rash sometimes follows the use of enemata. As a rule there is an idiosyncrasy on the part of the patient. It is said that it is only after a soap enema that the rash occurs; but, while this is commonly the case, it is not always so. Rectal saline infusions may sometimes have to be discontinued because of the skin eruption. The condition is probably due to the absorption of intestinal toxins, made possible by the enema or infusion. The rash, which is excessively irritating, is most troublesome to deal with, and it is some days before it entirely disappears. Nothing should be administered by the rectum to people who have previously suffered from this affection. Fortunately it is rare, but unless the practitioner be able to recognize it he may be much worried to account for the eruption, which varies in appearance from the erythema produced by quinine to the more common form of a diffuse urticaria. The internal administration of calcium lactate, as first suggested for ordinary urticaria by A. E. Wright—℥j once a day—is very useful, and the following lotion may be applied locally to relieve the irritation:

℞. Acidi hydrocyanici dil. - ℥j
Aquae - - - - - Oj
M. ft. lotio.

Secondary haemorrhage is a very rare complication in the present day, but since it does occur in the experience of the most skilled surgeons it is necessary to keep the possibility in mind. It may happen some days after operation, as the result of sloughing in a septic wound; or as an immediate postoperative occurrence from the giving way of vessels infiltrated with malignant disease, from the slipping of an insecure ligature, or from vessels that have not been tied at all. This last is especially liable to occur in amputations of the cervix when a general oozing may be difficult to control, and not appear to be serious during the operation. Again, at the end of a long operation, such as panhysterectomy with pelvic dissection for cancer of the cervix with the patient in the Trendelenburg position for a considerable time, the blood pressure has dropped considerably and haemostasis in the pelvis may appear to be perfect; but with a rise of blood pressure, and the alteration of the patient's position to the horizontal, bleeding may take place from veins which had hitherto been collapsed and escaped notice. It is always advisable, therefore, to raise the patient from the Trendelenburg position to the horizontal for a few minutes before closing the abdomen.

The **symptoms** are a sudden fall of the blood pressure in spite, perhaps, of salines; increased pulse rate, marked pallor, rapid respiration, with air hunger and restlessness in the more serious cases; and a fall of temperature to some degrees below the normal, associated with coldness of the extremities.

The **treatment** depends to a great extent upon the situation of the bleeding point. If it be in the vagina and easily accessible the vessel may be secured and tied, or vaginal packing may prove to be effectual where there is a continuous oozing. If the symptoms be urgent and the haemorrhage intraperitoneal venous infusions of normal saline solution should be at once resorted to, and the abdomen opened with the patient under the influence of morphine, and a small quantity of ether inhaled by the open method. The venous infusions must be continued until a good pulse volume and tension are obtained. If the operation have been panhysterectomy it may be possible to secure the bleeding point through the vagina, or to pack gauze through the vaginal vault and arrest the bleeding, while venous infusions are being administered. These procedures may save the patient from having the abdomen reopened.

It is important to remember that quite a moderate haemorrhage may cause marked symptoms if it should produce pressure on the nerves of the hypogastric plexus by being confined. This has occurred after supravaginal hysterectomy, when the blood has been shut in by the peritoneal flaps. Once the bleeding has been arrested

the sheet anchor of treatment is to make good the loss by intravenous, subcutaneous, or rectal infusions of normal saline solution with elevation of the foot of the bed, except in septic cases.

Shock and collapse are related, in that the pathology of the two conditions is the same, and it is advisable therefore to speak only of 'shock.' Any severe operation may produce shock, either by the prolonged manipulations which cause inhibitory impulses to be conveyed to the heart and vasomotor centres, or by excessive loss of blood. The result is the same: the circulatory system is affected, and there is a fall in the blood pressure and body temperature. It is impossible to tell at first whether the patient is going to suffer from a slight or severe degree of shock. In such cases the most important part of the treatment is directed towards raising the blood pressure. As the auxiliary details of treatment are simple they may be mentioned first. The end of the bed is raised on blocks; hot bottles, well protected, are placed near the patient, who is wrapped in warm blankets; the limbs are tightly bandaged and a pint of warm saline solution is run into the rectum. The temperature of the room is kept at 70°–75° F. Strychnine must not be used at all in cases of shock, for it does harm rather than good in an exhausted condition of the vasomotor centres, however useful it may sometimes be in bracing them up *before* operation. In every case 1 c.c. of pituitary (infundibular) extract (20 per cent.)[1] should be given intramuscularly, or intravenously in a pint of saline in serious cases, to raise the blood pressure. This drug is of far more value than ergot or adrenalin, in that it keeps the blood pressure raised for a considerable time. The dose should be repeated if necessary, and if means be at hand to register the blood pressure. Otherwise 1 c.c. may be given hourly until 3 c.c. have been given or the patient have improved. After each dose a refractory period is established for some time. If the patient do not rapidly improve a vein in the arm should be opened without delay, and two pints of sterile saline solution introduced at a temperature of 100° F. *as it passes through the cannula* (see p. 435). Sometimes it will be necessary to use some form of continuous saline solution until the patient's condition of shock has passed off. If the patient can retain and absorb rectal infusions the continuous method by the bowel is the most comfortable (see p. 438). If the vitality of the patient be low she will not absorb the saline from the rectum; in this case repeated venous infusions may be necessary: but before these are resorted to (unless the introduction be urgent) it is better to try the effect of continuous saline infusions under the breast (see p. 436).

[1] Sold ready sterilized in capsules ('Vaporole' preparation: Burroughs, Wellcome & Co.).

If these measures be promptly adopted and properly carried out it is extremely rare for a patient to die of shock. Since this condition, and other complications to be mentioned presently, depend for their seriousness and fatal consequences upon continuation of the lowered blood pressure, with the failure of a heart which is worn out by the rapidity of its action in its vain attempts to fill dilated vessels—like a bird trying to fly in a vacuum—it is very advisable that before a serious operation be undertaken the blood pressure of the patient should be estimated, in order that her normal standard may be known. It is an observation that can be made in a few moments, and can be readily done with the various modifications of the Riva-Rocci instrument (fig. 284). The normal systolic blood pressure in woman is about 120 mm. of mercury. A four-hourly record taken after the operation, if the patient be suffering from shock, or any of the other causes of altered blood pressure, enables the practitioner to be aware of the condition of his patient in a way nothing else can. It may warn him of the onset of uraemia or sepsis, when the blood pressure is high; or of shock or secondary haemorrhage, when there is a rapid fall.

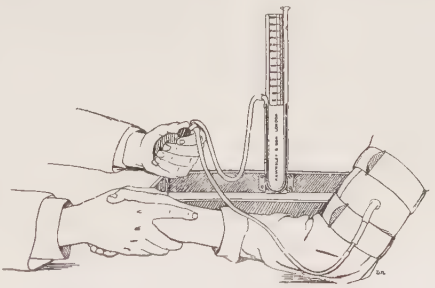


Fig. 284.—Martin's modification of the Riva-Rocci sphygmomanometer for recording the blood pressure.

SPECIAL COMPLICATIONS WHICH MAY OCCUR AFTER VAGINAL OPERATIONS.—Sepsis.—This must, if local, be treated on general lines; and, if abdominal after a vaginal section or hysterectomy, be treated as if following an abdominal operation (*v. infra*).

Fistulae, vesical or rectal, may follow vaginal operations, and require subsequent operation.

Protrusion of bowel or omentum may occur through the vaginal vault after a vaginal hysterectomy, owing to violent coughing or vomiting. Immediate cleansing of the part and replacement, with packing of the vagina, should be resorted to in these circumstances.

COMPLICATIONS WHICH MAY BE MET WITH AFTER ABDOMINAL OPERATIONS.—Abdominal distension.—Intestinal distension is usually symptomatic. Thus it may arise in association with *septic peritonitis* (*v. infra*): indeed there are those who say that all unaccounted for forms of distension after abdominal

operations are due to a mild grade of sepsis, but this is too sweeping an assertion. Distension due to peritonitis of an ordinary type is not easily overlooked.

Secondly there may be a *mechanical obstruction* to the passage of intestinal gas, the only remedy for which is another operation to remove the cause of the obstruction.

Apart from these there remains a group of cases in which there is a state of affairs known as *pseudo-ileus*: a more descriptive term, perhaps, is *paralytic distension*. Physiologically this is somewhat difficult to account for. From experiments by Kader and others it appears probable that the condition is brought about by disturbance of the portal circulation, with prolonged engorgement of the mesenteric veins, for experimental ligature of these vessels produces a condition of paralytic distension. Owing to the danger of this state of affairs, and the difficulty of effectually treating it, care must be employed to prevent the slightest degree of intestinal distension. As prophylactic measures, therefore, the surgeon must be very gentle in all manipulations of the bowel during the operation, and avoid prolonged pressure with the abdominal packs used to keep back or protect the intestines; and morphia should not be given after abdominal operations except in very small doses to relieve great pain.

By the use of the rectal tube and saline solution flatus is often induced to pass early, but until the bowels have acted no case is 'out of the wood,' so far as this form of distension is concerned. An aperient, therefore, unless strongly contraindicated, is given on the second night after operation (*v. supra*).

If, in spite of precautions, distension threaten, or be actually established, the judgement and experience of the practitioner may be tried to the utmost. The following methods of treatment have all been warmly advocated: rectal injections of enema terebinthinae; of quinine (gr. xv in half an ounce of whisky with half a pint of water), and of alum (one ounce to the quart of water). Physostigmine salicylate given hypodermically (gr. $\frac{1}{40}$ to gr. $\frac{1}{60}$) has, too, been strongly recommended. Light singeing of the abdomen with a Paquelin cautery has also been advised. All these more or less unreliable methods are likely to be superseded by pituitary (infundibular) extract (20 per cent). This preparation, given intramuscularly in a dose of 1 c.c., produces intestinal peristalsis and the expulsion of flatus in a few minutes. The results are remarkably striking, and since it is given intramuscularly it can be administered even though the patient be vomiting incessantly. It is not a bad plan to give a turpentine enema after the administration of the infundibular extract if the patient complain of griping pains, but this is by no means necessary. If, how-

ever, the patient be really in a serious condition before attempts are made to combat the distension, it may be necessary to relieve her by reopening the abdominal wound in part of its length. The first piece of small intestine that presents is secured and opened. If the patient's condition warrant further interference several feet may be 'milked' on to a glass tube, after the plan suggested by Moynihan for distended gut above an obstruction (fig. 285); very great care must be taken not to damage the bowel by this procedure, or more harm than good may result. The opening in the gut is stitched to the wound and glass tubes are tied into the lumen for drainage. Even these heroic measures may be unsuccessful in serious cases, so that great attention must be paid to prophylaxis and early treatment with infundibular extract.[1] In connexion with pseudo-ileus it is most important to remember that the abdominal wall is not rigid or tender. Distension may, of course, stretch and render tight the parietes, but before that stage is reached this condition can be distinguished from the distension associated with peritonitis by the softness of the abdominal wall on palpation. Another useful method of distinguishing between paralytic distension and that dependent on peritonitis is by percussion of the abdominal parietes. If there be peritonitis present the patient resents the slightest tap; with the paralytic distension, on the other hand, percussion may be carried out without any objection on the part of the patient.

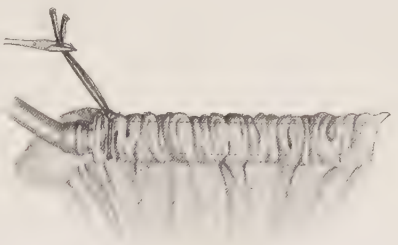


Fig. 285. — Moynihan's method of emptying distended intestine. (*From Moynihan's 'Abdominal Operations.' W. B. Saunders & Co.*)

Acute gastric distension (paralytic distension of the stomach) is sometimes seen after abdominal operation. It should be treated by lavage and infundibular extract.

Sepsis may occur locally in the abdominal wound or in the peritoneal cavity, or it may give rise to wide-spread or general peritonitis.

Sepsis in the abdominal wound cannot always be avoided, in spite of the greatest precautions. This is especially the case in operations for cancer of the uterus, and for purulent salpingitis, or other local

[1] It is very unlikely that it will ever be necessary to reopen the abdomen to relieve *pseudo-ileus* now that we have the infundibular extract to effect the rapid evacuation of the paralysed bowel in these cases; for in one case a surgeon opened the bowel twice and still failed to relieve his patient until he administered 1 c.c. of this extract when an evacuation occurred in five minutes.

septic conditions, when the wound may be accidentally infected during the removal of the diseased structures. This can be guarded against to a great extent by the use of the ring retractor (fig. 301). Local infection in the wound requires no special mention here, for the ordinary surgical principles should be employed to deal with it. It may be mentioned, however, that if the patient develop pneumonia or bronchitis the wound frequently 'goes wrong'; that is to say a mild grade of sepsis occurs, and is usually not discovered at first, as the skin may heal by first intention. Probably some small collection of blood becomes infected, and suppurates, owing to the lowered resistance of the patient.

If an abscess form in the pelvis after a pelvic operation it is often advisable to open this through the posterior vaginal cul-de-sac, and to drain it through the vagina. It should be borne in mind that occasionally these local abscesses have been caused by the carelessness of leaving behind a dab placed in Douglas' pouch or elsewhere during the operation.

When, however, general or extensive peritonitis occurs we must be prompt in our methods if we would combat successfully one of the gravest conditions a surgeon is called upon to face. But the worst of these cases are now oftentimes saved, so that none should be considered hopeless until they be moribund. The peritonitis may have been present before operation, and the operation undertaken on account of it; or the peritonitis may follow operation from some flaw in the aseptic technique, or from some injury to the bowel, or because a local infection has become generalized in the peritoneal cavity. In all cases in which there is a general peritonitis at operation, or in which a serious septic local pelvic condition is found which threatens to spread up into the general peritoneal cavity, the patient should be placed back in bed in the *sitting position* introduced by Fowler, in order to prevent infective material reaching the rich lymphatic area of the peritoneum in the upper abdomen. This position, too, should be adopted if pelvic peritonitis after operation give indications of spreading.

The **symptoms of peritonitis** are rigidity and tenderness to palpation of the abdominal wall, with little or no movement on respiration. Nervous patients frequently complain of great abdominal tenderness after operation, and may hold the abdominal muscles rigid, so that, in order to test the possibility of the presence of peritonitis, we have to resort to subterfuge, and it is a good plan lightly to tap the surface of the abdomen with the bent middle finger. As a rule a nervous patient allows this to pass unnoticed—the area involved being so small—but if peritonitis be present the patient suffers pain which is unmistakable.

So, too, if the attention of a nervous patient be distracted and she can be induced to talk, a hand laid gently on the abdomen and kept there for some minutes can be pressed upon fairly heavily *with the other hand* (this indirect method deceives the patient) without causing any pain in the absence of peritonitis. Another very important point which assists us is the patient's facial aspect.

In peritonitis there is intestinal paresis: neither faeces nor flatus is passed, and distension gradually sets in. Vomiting is an early and distressing symptom, and the tongue soon becomes dry and coated with brown fur on the surface, while the edges and tip are the colour of raw beef. Eventually the respirations become rapid, the eyes hollow and the expression eager and anxious. There is often great thirst. The pulse at first is raised in tension, but with the progress of the toxaemia the blood pressure falls, and at the same time the pulse-rate increases in frequency.

We are generally face to face with a desperate condition, because there is not only the urgent local symptom of paralysis of the bowel, but also the general toxaemia with an impending breakdown in the circulatory system. Although paralysis of the bowel is Nature's method for dealing with the lesion responsible for the peritonitis, once the lesion has been circumscribed by adhesions, paralysis and distension can do no further good, short of preventing the infective material from reaching the diaphragm. This can be provided against by Fowler's position, and peristalsis should therefore be encouraged. Turpentine enemata, or one of the others mentioned (p. 428), should be administered, and small doses of calomel (gr. $\frac{1}{6}$), mixed with a few grains of sodium bicarbonate, given every hour until the bowels act. Sometimes excessive vomiting prevents the administration of calomel or other drugs by the mouth, in which case it is no good persevering in the attempt. In such circumstances infundibular extract (*v. supra*) should be given intramuscularly. But once more our sheet-anchor must be continuous normal saline infusion, given as for shock. This increases diuresis, which favours the elimination of toxins. There is also actual dilution of the toxins in the blood by the fluid absorbed, and the falling blood pressure is raised.

If there be any prospect of finding a local lesion or collection of pus in the abdomen laparotomy should be performed at once, the infected area dealt with and efficient drainage provided. Even if no lesion be found the pelvis should be thoroughly drained. By the continuous use of salines the peritoneum is converted into a secreting, instead of absorbing membrane, and the toxins are flushed out of the abdomen. This is readily appreciated when one observes how much the discharge from the drainage tubes is increased by the use of saline infusions.

If the sepsis be of a chronic nature a vaccine may be prepared from the organism concerned, and the patient treated with this. Up to the present but little success has followed the treatment of acute infections with vaccines, but polyvalent sera of the pyogenic organisms have sometimes proved of value.

Vomiting.—Quite apart from 'anaesthetic vomiting' which usually commences on recovery from anaesthesia, vomiting may come on later, and it is necessary to remember that it is then most commonly a symptom of some (generally serious) intraabdominal lesion or general toxaemia. Among the causes of late postoperative vomiting the following may be mentioned:

Strangulation of a piece of bowel by adhesions, through a hole in the omentum or mesentery, by being forced into and nipped by the abdominal wound, or by strangulation from kinking or twisting round an adhesion to the bowel. These conditions are often due to errors in operative technique, generally the result of careless or hurried operating. All holes should be carefully closed and all bare surfaces covered.

The nipping of a piece of omentum or bowel which has forced its way into the abdominal wound owing to imperfect closure. Or a piece of omentum may find its way through a hole in a drainage tube and become strangulated: this is avoided if the tube be turned slightly once or twice a day.

Peritonitis.—Vomiting is a constant symptom of this condition. The disease for which the operation has been performed may have been of a septic nature, or sepsis may follow the operation.

A gauze pack or drain in the abdominal cavity frequently causes reflex vomiting. This ceases as soon as the pack is removed.

A foreign body in the abdominal cavity, such as a pair of forceps or a dab, carelessly left inside by the operator, may give rise to intestinal obstruction with the associated vomiting; or the vomiting may be of a reflex character induced by the irritation caused by the foreign body.

Toxaemias apart from sepsis.—The following are the most common:

(1) *Uraemia* from suppression of the kidney functions. Hot packs must be immediately employed, and pilocarpine used hypodermically if not contraindicated by bronchitis or other pathological conditions. If these and other medical measures do not relieve the suppression the surgeon must consider the question of decapsulation of the kidneys; and this valuable procedure should not be left until the patient is moribund.

(2) *Acidosis.*—This condition may supervene as a result of any toxaemias—infective, anaesthetic, or autogenous. It may be detected by the presence of diacetic acid in the urine. Both for prophylaxis and for treatment carbohydrates (especially glucose) and alkalies (sodium

and potassium bicarbonates) with ordinary saline infusions to promote diuresis have been found of the greatest value.

Thirst is a condition which is not seen in the present day if the routine treatment with saline injections, already described, be followed after abdominal operations; although formerly under the older methods of treatment this was one of the most dreadful of the patient's sufferings. After every abdominal operation there is a great loss of fluid from the general circulation, either by excretion or by the determination of blood to the abdominal veins. This loss can be entirely made good by the rectal injections of normal saline solution, without the necessity of pouring fluids into the stomach and thereby causing vomiting. Thirst, however, may be a symptom of a septic condition, and its relief depends on the proper and successful treatment of that state of affairs.

Venous thrombosis.—One of the most distressing 'accidents' (as we euphemistically call them) that can happen in the experience of any surgeon is the sudden death of a patient from pulmonary thrombosis and embolism, when she is practically convalescent. It is also extremely aggravating both to the surgeon and his patient if the convalescence of the latter be delayed by thrombosis of the femoral or iliac veins, with oedema of the leg—a by no means uncommon occurrence after pelvic operations. This form of thrombosis usually occurs on the left side. The pathology of these conditions has not been completely worked out, and the processes involved in the clotting of blood in normal and pathological conditions are even now the subject of frequent investigations which lead to constant revisions in the previously accepted 'facts'! However, it has been more or less definitely decided that there is an *optimum* clotting condition of the blood when all the factors in that process are in the best possible relationship, and further that clotting of the human blood does not occur in healthy vessels. If, however, vessels be damaged by mechanical means, or by inflammatory changes, then normal blood will clot in them. Further it has been shown that no increase of any of the normal clotting factors in blood will cause it to clot in healthy vessels, but that the addition of certain adventitious nucleoproteins will bring this process about.

Now during pelvic operations there is always a great liability to injure large venous trunks if roughness be employed in the removal of big tumours, in the breaking down of adhesions, and so on. Consequently great gentleness should always be employed in all intra-abdominal manipulations.

Any septic infection of a vein may lead to thrombosis in that vein, and give rise to septic emboli which, on gaining admission to the general circulation, cause pulmonary embolism and death or pyaemic abscesses. Some think that venous thrombosis never occurs except in

the presence of sepsis. There is no doubt this is an important, but not all-important factor.

Avoidance of injury to veins and of sepsis are, therefore, considerations of some moment in the prophylaxis of thrombosis. Anything which will reduce the clotting power of the blood below the *optimum* must also be held to be of value; and there is little doubt that the routine use of rectal saline infusions helps to keep the blood below the *optimum* point. Citric acid and the citrates have been supposed to lessen the coagulability of the blood, but recent research has shown that it is extremely doubtful if by *oral* administration such a result can be obtained.

Another point of importance in the prophylaxis of thrombosis appears to be the moving of the patient about soon after the operation. She should be encouraged to move her legs and arms freely from the first, and should be turned from side to side by the nurse in attendance as often as she so desires; indeed she should not be allowed to remain long in one position.

The **treatment** of thrombosis is somewhat difficult. If the lesion be local in the pelvic or femoral veins the patient must be kept very quiet, for fear of setting free an embolus, and the affected leg wrapped in wool and bandaged. If there be pain the part should be painted with belladonna and glycerine (ext. belladonnae ℥ j, glycerin. ℥ j). In time the collateral circulation will make good the deficiency, or the thrombus in the vein will become canalized. Recovery usually results, but the function of the limb may be impaired for some time, and an elastic bandage should be worn to control the swelling which always follows thrombosis in the main vein.

Pulmonary thrombosis and embolism—the latter is supposed to supervene on the former—are nearly always fatal, but not necessarily so. If the pulmonary artery be entirely blocked death rapidly occurs; but blockage of a small branch, although producing serious general symptoms, and locally an infarction of the lung, need not be fatal. Recently it has been suggested, and indeed carried out with partial success in one case, that the pulmonary artery should be opened after removal of some of the costo-sternal cartilages, and the clot extricated. This formidable procedure will not, however, be possible in the majority of cases, so rapidly does death take place.

Parotitis more frequently follows pelvic than other abdominal operations. Especially liable is this complication to occur when there is sepsis present. Suppuration occurs in about one half of the cases of metastatic parotitis. Some believe that oral sepsis is entirely responsible for the infection of the gland, consequently it is of great importance to see that the mouth is clean before operation.

Treatment consists of the application of hot fomentations to the inflamed gland and antiseptic mouth-washes. Should suppuration occur the abscess must be opened.

§ viii. THE ADMINISTRATION OF SALINE INFUSIONS.

This section is devoted to the methods adopted for the administration of saline infusions which play such a prominent part in the post-operative treatment of serious cases in the present day.

Normal saline solution consists of a 0·75 per cent. solution of sodium chloride in water. For ordinary purposes one teaspoonful of common salt may be dissolved in a pint of water, which is *then* sterilized by boiling.

Venous infusion.—For the performance of this small operation the arm of the patient is allowed to hang down beside the bed in order that the veins may become filled. A bandage is then wrapped tightly round the upper part of the arm, and the skin area of the bend of the elbow purified—painting with iodine solution (5 per cent. in rectified spirit) is sufficient. An oblique incision is now made over the most prominent vein in this region, usually the median basilic, which is freed from the surrounding tissues. With an aneurism needle a double ligature of catgut is passed beneath the vein, and the loop cut. The lower ligature is then tied and a loose knot made on the upper ligature (fig. 286). Next the sterilized infusion apparatus, which consists of a glass or metal cannula attached by a rubber tube four feet long to a glass funnel, is filled with normal saline solution at a temperature of 105° F. The temperature as it leaves the cannula should be 100° F. While this solution slowly drips from the end of the cannula, in order to prevent the entrance of air to the vein, the latter is *nicked* with scissors, and the cannula thrust in towards the heart. The upper ligature is now temporarily tied round the cannula, and the required quantity of saline solution slowly run into the vein. If the solution run in easily the funnel should not be raised more than a foot above the level of the patient's arm, but if it run in only with difficulty the funnel must be raised to a sufficient height to insure the desired result. When enough solution (one to three pints) has been introduced the cannula is removed, and the upper ligature firmly tied. The skin incision is closed with a stitch or two, a dressing applied and the arm bandaged.

If the superficial veins be much collapsed some difficulty may be experienced in inserting the cannula into a vein in the arm. In these circumstances the internal saphena vein in the leg should be made use

of. It is not advisable to use a needle cannula for venous infusion, for if the vein be small and collapsed, as is frequently the case, one is apt to thrust the cannula through both walls of the vessel.

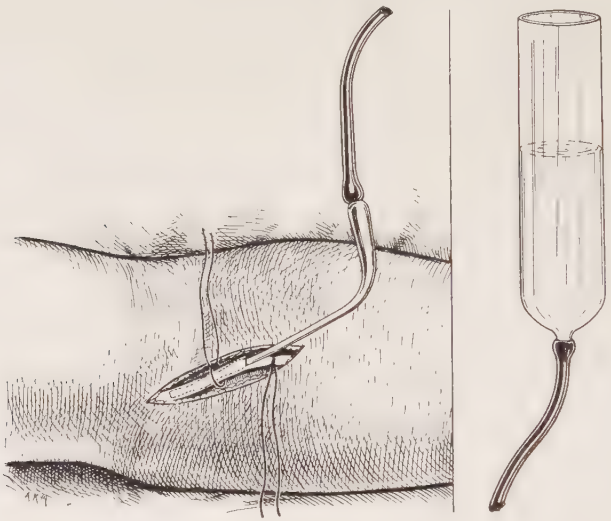


Fig. 286.—Intravenous infusion of saline solution. At the left side of the illustration the median basilic vein is seen exposed, the lower end tied and the cannula (author's pattern) inserted ready to be tied in position. To the right is seen the funnel which is connected by rubber tubing with the cannula.

No alarm need be felt if the patient have a slight rigor after the venous infusion. This is not uncommon.

Subcutaneous saline infusion.—Saline solution may be continuously or intermittently introduced by this method. In the latter case one or two pints are infused and the needles removed; in the former the solution is run in slowly until sometimes as much as fifteen pints has been introduced in twelve hours. As a rule it is not advisable to give more than ten pints continuously, nor more than fifteen pints in twenty-four hours. If too much be given oedema of the lungs may be produced.

The best apparatus for use in subcutaneous infusion is that known as Barnard's. This consists of two fine hollow needles, each attached to a separate tube. These join a single larger tube at a **Y**-shaped junction. Through the main tube is syphoned the saline solution from an apparatus in which it is kept warm (108° F.) at the bedside. The length of tubing through which the solution passes is sufficient to bring the temperature down to 100° F. as it enters the body. The apparatus for containing the fluid is a simple arrangement of a tank, holding, say, a quart of saline solution, which is suspended in a bath of water,

the temperature of which regulates that of the saline solution. The heating of the water bath is effected by means of a small spirit lamp (fig. 287).

If such an apparatus be not at hand a careful nurse can maintain an even temperature in the saline solution by standing the jug containing it on a block in a bucket of hot water. Fresh hot water can be added from time to time.

When all is ready the syphonage is started by squeezing the ball pump on the main tube. The saline then runs through the needles, which are inserted in the selected regions—the axillae, the thighs or in the submammary tissues (fig. 287). The last is the best site to select.

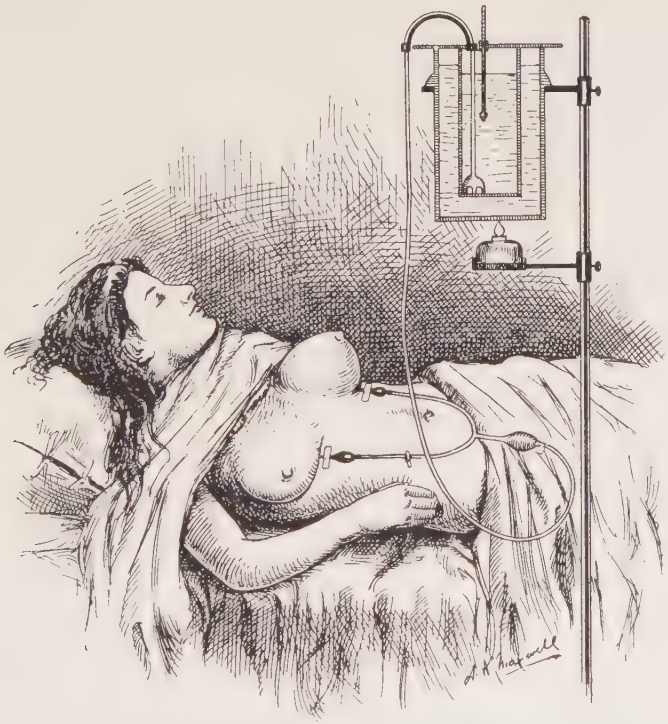


Fig. 287.—Subcutaneous (submammary) method of administering continuous saline infusions by means of Barnard's tubes. In the illustration the left breast is very prominent owing to the collection of a large amount of fluid, as yet unabsorbed, in the submammary cellular tissue. The right breast is flaccid as the tube on that side is clipped for the time being in order that the fluid already introduced may be absorbed. Note the tank, shown in sectional view, in which the saline fluid is kept at an even temperature.

Care must be taken to get the needles *under* the mammary tissue. This is effected by grasping the breast with the left hand, and raising it well up. The needle is then thrust through the skin and pushed in

between the mammary gland and the pectoral fascia. Here the tissue is very loose, so that little pain is caused if the flow be stopped every now and then, to allow of absorption, as soon as the skin gets stretched. In this manner many pints can be conveniently introduced into the system.

Rectal saline infusions (proctolysis) may also be occasional or continuous. There is no reason to mention further the occasional routine postoperative infusions which have already been described.

The continuous rectal saline infusion is the most comfortable method of continuous administration, but it is not always available, for the patient may be so ill that the salines are not absorbed from the rectum, or there may be diarrhoea or rectal intolerance. In most cases, however, this method can be employed for a certain time.

The saline is syphoned into the rectum through a very fine (No. 1) soft rubber catheter, or a tube made for the special purpose. Care must be taken to have the rectum quite empty, otherwise the catheter will get blocked; indeed frequent removal may be necessary in order to clear it. The apparatus for containing and warming the saline solution is similar to that already described for use in subcutaneous infusions. Just as by the subcutaneous method, large quantities ('massive infusions') of saline solution can generally be introduced into the system by means of rectal absorption.

CHAPTER XVI.

THE MAIN PRINCIPLES OF GYNAECOLOGICAL OPERATIONS, WITH SOME DETAILS OF THEIR TECHNIQUE.

At any moment the practitioner may be brought face to face with the knowledge that between his patient and certain death there lies only his skill. For this reason, if for no other, everyone should possess to the full a general knowledge—even if the practice and detailed skill be lacking—which will enable him to perform that duty which may be thus suddenly thrust upon him. Besides, no consideration of gynaecology would be complete without a short description of the chief surgical procedures as at present practised.

Gynaecological operations are carried out by either the abdominal or vaginal route, and occasionally by a combination of the two.

For the sake of clearness the preparation of the patient and her surroundings for operation, and the after-treatment have been discussed in a previous chapter. In this chapter abdominal and vaginal operations will be considered separately.

§ i. THE SURGEON'S PREPARATIONS.

It will be necessary first of all to mention some of the requisites that the surgeon must provide and bring with him for the performance of an operation.

Firstly, with regard to those requisites which are common to both the abdominal and the vaginal operations.

In the present day every surgeon owes it as a primary duty to his patient that everything connected with, or liable to come into contact with, the operation area shall be thoroughly sterilized. It is the

custom to sterilize in steam all dressings, bandages, gowns, caps, dabs, gauze packs, and cloths. This can best be carried out in a high-pressure steam sterilizer. The most expensive, and probably the best, are those manufactured by the Kny-Scheerer Company. They are known as high-pressure vacuum sterilizers. So costly are they that they can only be possessed by hospitals and surgeons in active practice. There are, however, cheaper forms in which the vacuum arrangement is dispensed with (fig. 288), and these are usually quite efficient, the contents being sterilized by steam under pressure at 250° F.; but they require a little care in working, in order to insure that the dressings shall be dry. Then again, there are sterilizers such as Stack's (fig. 289), in which the contents are submitted to steam at the ordinary atmospheric pressure. Dressings, overalls, cloths, etc., sterilized in these for an hour should be quite free from all ordinary pathogenic organisms; at the same time they are probably not entirely reliable, owing to the want of penetrating power of steam not under high-pressure. However, in default of a more expensive apparatus they should be used.

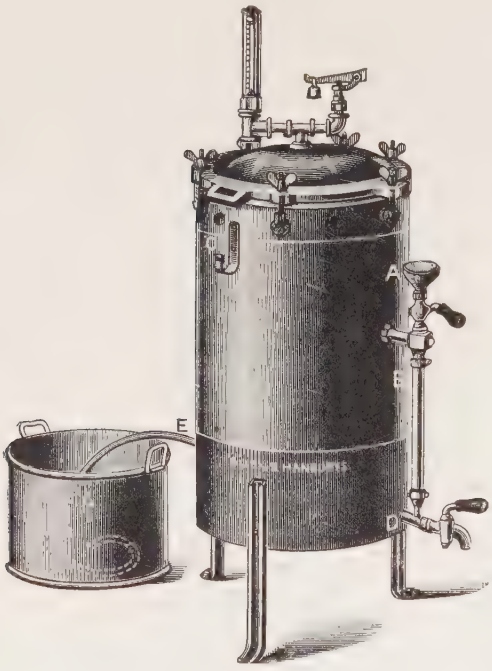


Fig. 288.—High pressure steam sterilizer.

If steam be unavailable all cloths, packs, dabs and the like should be carefully enclosed in another cloth, or thick calico wrapping, and the whole boiled in water for a quarter of an hour, and subsequently dried unopened in an oven.

In an emergency, without any adequate apparatus for sterilization at hand, everything that is to be laid around the wound or to come in contact with it must be boiled, or soaked in an antiseptic solution. Overalls and anything that has not been sterilized must in these circumstances be kept from coming in contact with the wound. In such a case it is hopeless for the practitioner to attempt to conduct the operation 'aseptically'; so a judicious use of antiseptic

lotion (1–3000 solution of biniodide of mercury) is necessary, and everything that has to come in contact with the wound area must be thoroughly soaked in this solution.

For the purification of the skin of the patient see page 419.

All the instruments must be boiled—a fish kettle makes an excellent sterilizer—and it is advisable to put a crystal or two of washing soda into the water, to prevent oxidization (rusting) of the instruments.

Purification of the hands.—The surgeon should purify his hands, nails and arms thoroughly by washing with a soft nail-brush in warm

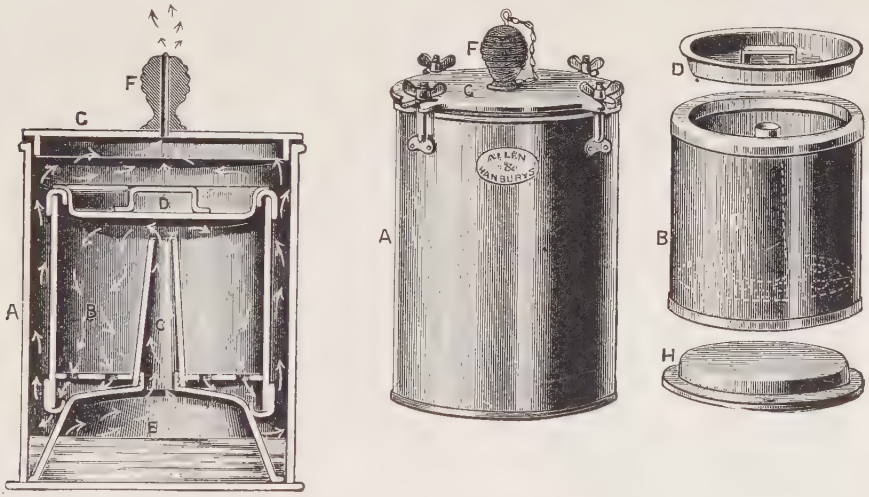


Fig. 289.—Stack's dressing sterilizer.

water (running, if possible) for five minutes. He should then soak them in a mixture of 75 per cent. alcohol (or methylated spirit) and water for one minute and afterwards in an aqueous solution (1–500) of biniodide of mercury for three minutes.

If he prefer, after washing, the hands and arms may be soaked in a saturated solution of permanganate of potash for two minutes; this is washed off subsequently in a hot saturated solution of oxalic acid; the acid is then neutralized by rinsing the arms and hands in boiled lime water. The first, however, is the simpler method for private practice, though more severe on the skin.

Rubber gloves and other personal coverings. All modern surgeons wear rubber gloves when operating, and require their assistants to do the same. After a little practice it feels quite strange to operate without this protection to the patient and to the operator. The gloves may be sterilized with the dressings, or

preferably be boiled in water, but in the latter case not with the instruments, which are blackened by the sulphur contained in the rubber. When putting on a rubber glove sterilized in this way it must be full of water in order that the hand may slip in easily. When dry sterilized gloves are used they should contain some French chalk.

Fig. 290.—Surgeon wearing sterilized gown, head and face cap and rubber gloves ready to operate.

The other personal coverings of an aseptic surgeon consist of an overall, and a cap and mask (fig. 290).

Ligatures and sutures.—The choice of ligature and suture material has for long exercised the minds of surgeons, but it has only been recently realized that sterilization of the materials used is not difficult, and that bad results have more often been due to imperfect asepsis in other directions than in regard to the ligatures themselves.

The following materials are useful for gynaecological work:

Silk.—Chinese twist and what is known as braided silk are the materials most commonly used.

No. 1 braided silk is useful for the suture of peritoneal surfaces and intestinal wounds, and for fine ligatures such as those required for tying small vessels in the wound incision. A thicker and stronger material, such as No. 2 Chinese twist, is the most useful for the ligation of isolated vessels of large calibre.

Silk may be used with impunity and without any disagreeable reminders of its presence inside the peritoneal cavity, and for suturing the peritoneum itself, so long as no sepsis occur. If tied in a reef knot, and sufficient tissue be left beyond the knot, the ligature will not slip. Silk should not be used elsewhere, for even if perfect asepsis obtain it is apt to 'come away'; that is to say, it may give rise to mechanical irritation which causes it to be extruded many weeks or even months after the operation. Needless to say silk must not be used in dealing with infective conditions, for it will almost certainly become contaminated and be a source of subsequent trouble in such circumstances.

Silk can easily be sterilized, without deterioration, if boiled on the stretch for ten to fifteen minutes. Figure 291 represents reels and a convenient container for this purpose. It will be seen that the reels are split to allow of the contraction of the silk and at the same time to keep it on the stretch.

Catgut.—No. 1 (ordinary) may be used for closing the peritoneal cavity, for stitching together peritoneal flaps in the pelvis, and for small 'skin incision' vessels.

Catgut No. 3 (chromic) should be used for suturing the parietal aponeurosis and for operations on the vagina and perineum. Chromic

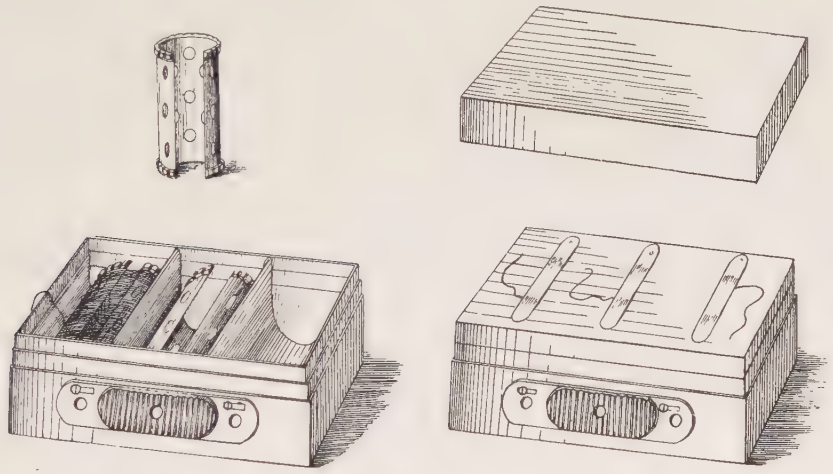


Fig. 291.—Author's spring reels and container for the sterilization of silk.

catgut (No. 3) is also far preferable to silk for the ligation of pedicles; for there is no doubt that the inclusion of nerves in the ligated pedicle may be a source of subsequent pain. This pain persists if silk be used, but disappears with the absorption of the gut ligature.

No. 1 or No. 2 chromic catgut may be used for operations on the cervix and for subcutaneous skin sutures.

There is no great difficulty about the sterilization of catgut; and as all surgeons have a strong preference for an absorbable ligature material catgut should be used whenever possible. For those who have not the time, patience nor conveniences for sterilizing catgut there are reliable preparations on the market. These are usually trustworthy as regards sterility, but occasionally the material is too brittle. They are, however, very costly.

To sterilize catgut there are many methods. The simplest is merely to wrap each skein round stretchers and to leave it to soak for

three weeks in a solution of iodine in proof spirit (1–10). At the end of that time the catgut is absolutely sterile; and it may be stored for any length of time in, and used direct from, a one per cent. solution of iodine in alcohol. It is advisable, however, to soak the gut for a few minutes in normal saline solution before using, in order to soften it.

Since most surgeons feel that it is safer to insure sterility by means of heat the simple procedure of Bartlett for the sterilization of catgut may be described. The catgut is unravelled and hung in a drying chamber at a temperature of 180° F. for one hour, and at 220° F.—to which the temperature is gradually raised—for a second hour. When cool it is placed in alboline (liquid paraffin) for several hours. A glass beaker, lined with cardboard at the sides and bottom, is then taken and a metal lid, with a hole bored in the centre, is obtained. The beaker is three parts filled with alboline and the spools of catgut dropped into it. The beaker is now placed upon a sand bath over a Bunsen flame and a thermometer registering up to 350° F. is put into the paraffin through the hole in the lid (fig. 292). The temperature is next slowly—half an hour should be occupied in the process—raised to 320° F. This degree of heat is maintained for half an hour and the temperature then allowed slowly to fall. The catgut is now removed from the beaker with sterilized forceps and placed in an alcoholic solution of iodine—one per cent.—in which it is stored. When properly prepared—and this requires a little skill and practice—the gut is soft and of a good tensile strength.

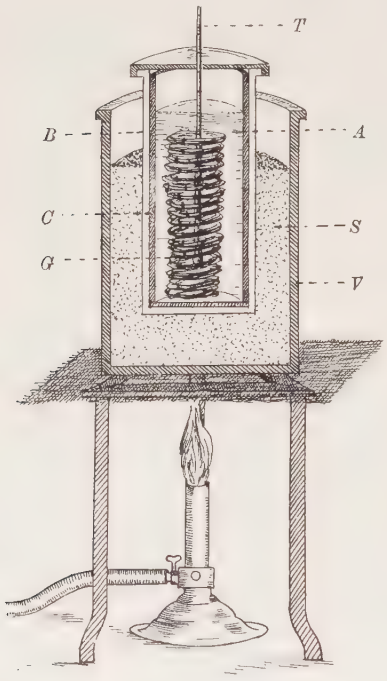


Fig. 292. –Bartlett's method of sterilizing catgut by heating in alboline.

V. Metal beaker, containing sand (*S*). *B*. Glass beaker lined with cardboard (*C*) and containing alboline (*A*) in which the catgut (*G*) is sterilized at a temperature of 320° F. as registered by the thermometer (*T*).

Catgut may also be sterilized by another heating method known as Mayo Robson's. In this the catgut rolled on spools is enclosed in a special container (fig. 293), which is then filled with xylol. After the lid has been tightly screwed on, the whole apparatus is boiled in water

for half an hour. Subsequently the gut is removed and stored in the manner described above.

Silkworm gut.—This material is frequently used for the closure of the abdominal wound, when the 'through and through' method of suture is employed for rapidity; it also forms a good material for interrupted skin sutures. It is better to use dyed silkworm gut, for this can be more readily seen than the uncoloured variety.

Fig. 293.—Mayo Robson's catgut sterilizer.

For 'through and through' sutures very thick silkworm gut should be used, and for skin sutures very fine.

This material is sterilized by boiling in water. A convenient method is to double up a dozen or more strands, and place them inside a glass drainage tube which is boiled with the instruments. When required for use during the operation one strand at a time can easily be withdrawn from the tube by seizing a loop with a pair of forceps (fig. 294).

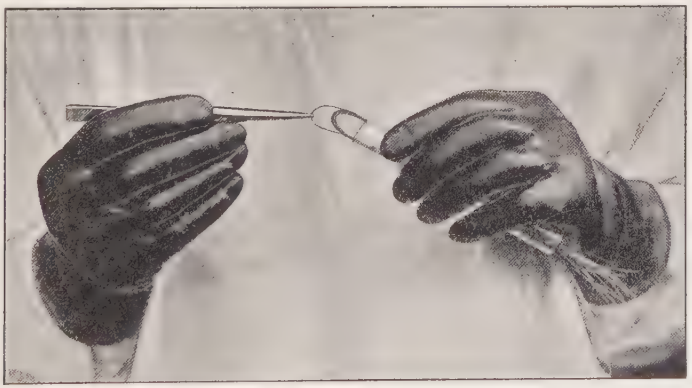


Fig. 294.—Method of carrying silkworm gut in a glass drainage tube, and the withdrawal of a single thread without disturbing the rest.

§ ii. ABDOMINAL OPERATIONS.

When the patient is fully under the influence of the anaesthetic, and the surgeon ready to operate, the dressings are removed and the abdomen recleansed. The patient is then covered, first with a sterilized abdominal cloth in which there is an aperture about 12 by 6 inches in

size, through which the operation is performed. Other smaller sterilized cloths are then laid across the chest and over the legs, above and below this opening (fig. 295). If necessary the abdominal cloth may be kept

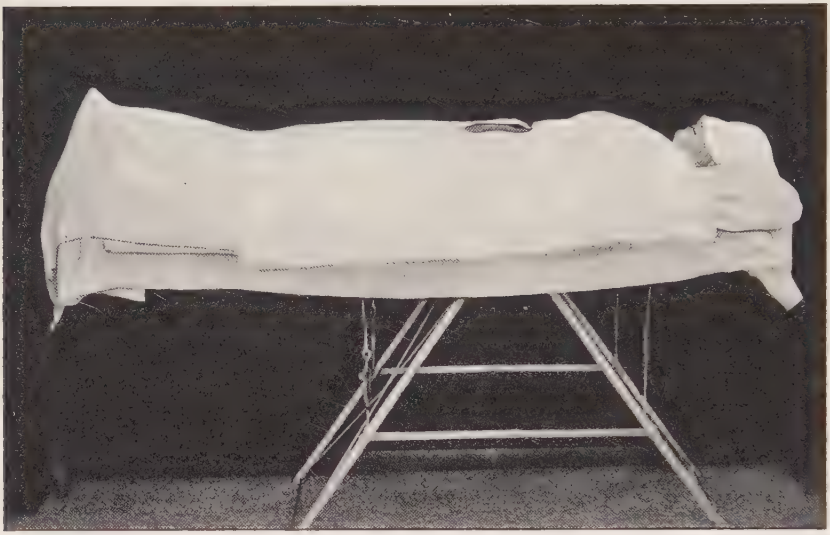


Fig. 295.—Patient on operation table covered with sterilized cloths ready for abdominal section.

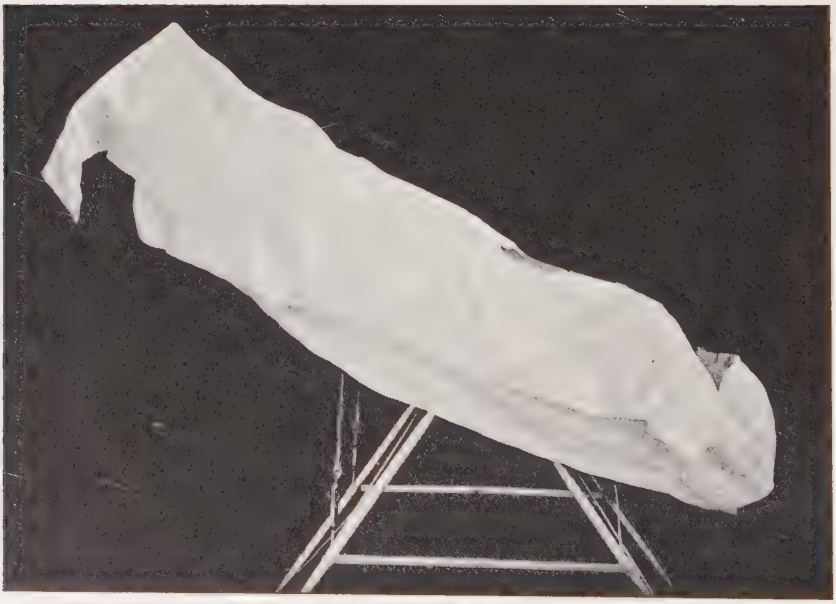


Fig. 296.—Patient in the Trendelenburg position.

in position by fixing it to the skin of the abdomen with special clips.

Before the operation is commenced a list of the instruments and the number of the dabs, packs and forceps to be used by the surgeon should be pinned up somewhere in the room.

In order to carry out efficiently pelvic operations by the abdominal route it is necessary in many cases to employ what is known as the **Trendelenburg position** (fig. 296), by which the upper part of the patient's body is lowered and the pelvis raised. By this means the intestines are caused to fall into the upper part of the abdominal cavity when a good view of the pelvic organs is obtained (fig. 297).

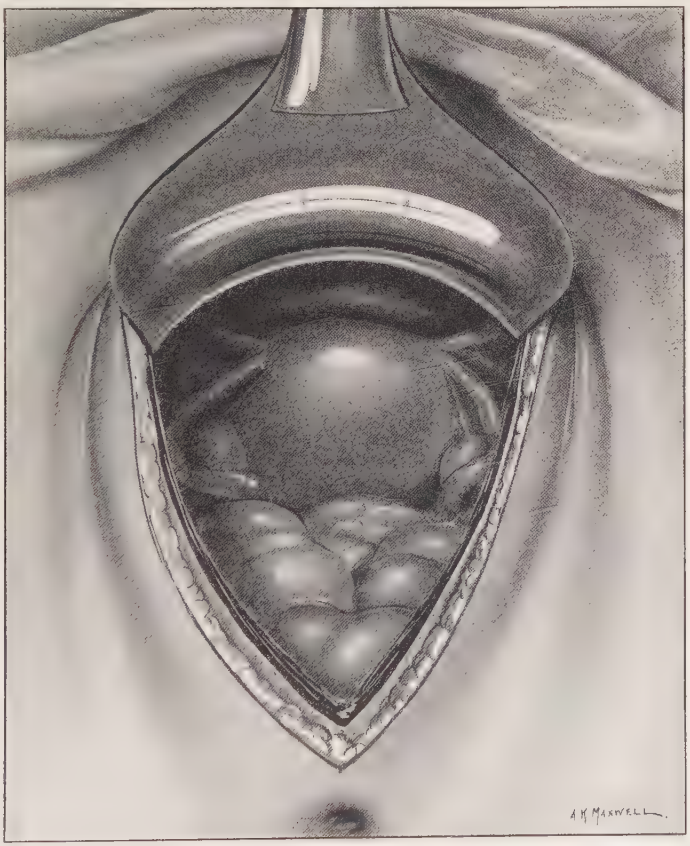


Fig. 297.—The pelvic organs with the patient in the Trendelenburg position. The intestines have fallen back towards the upper abdomen, and the pelvic organs have been raised into view.

The opposite or feet-down position is also a very desirable one when pus is suddenly encountered in the pelvis; for in such

circumstances it is always important to confine it to that region. So, although emergency operations can be carried out on a flat table, the best work is done upon a table in which the above positions can be easily obtained.

There are many hospital tables which meet the first of these requirements, that is the Trendelenburg position, but few which meet the second.

In regard to portable tables there are very few that meet either of these requirements. The table seen in figure 298 is readily moved into

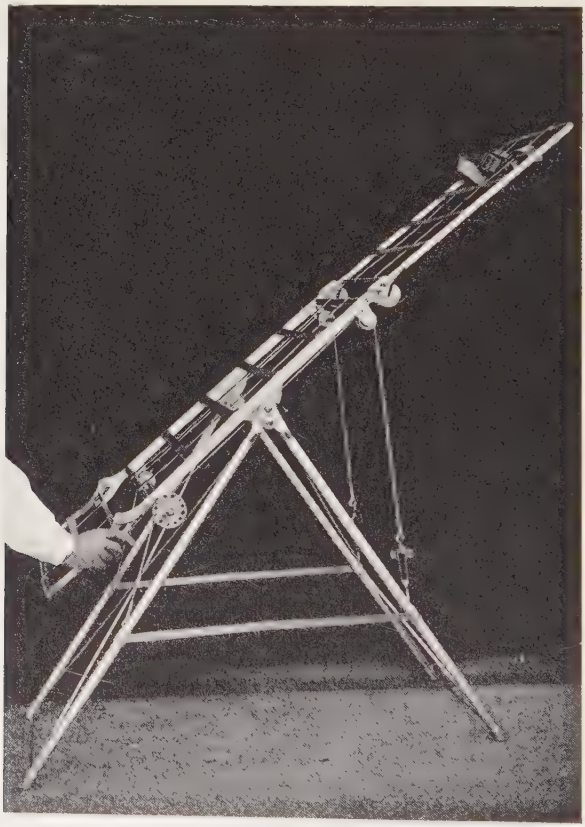


Fig. 298.—Author's portable operation table, showing how the Trendelenburg position is obtained by the anaesthetist, who depresses the head-end of the table after releasing a lever with his forefinger. Note also the ankle straps at the foot-end.

either position; it is made entirely of steel, and weighs only thirty-five pounds. This table can quickly be put up, or taken down and packed. The Trendelenburg and the feet-down positions are obtained by pressing a spring and raising or lowering the end of the table, which

is pivoted in the centre. The movements are obtained and retained by means of wire cords which take a turn or two round revolving cylinders. Various other positions, such as the lithotomy, are also arranged for.

When the patient is in the Trendelenburg position she has to be kept from sliding off the table; this is best accomplished by anklets, such as those used with the above table, rather than by shoulder props, which tend to cause compression of the chest and shortening of the abdomen. Hanging the patient by the flexed knees is also clumsy and often causes injury.

The difference between operating with the patient straight out on a table such as the above, and doing so on a table with the patient all huddled up in a very moderate Trendelenburg position, has to be experienced to be appreciated.

It is necessary to point out here that there are grave disadvantages in keeping the patient in the extreme Trendelenburg position for too great a length of time. She should be lowered into it gradually, and gradually brought up to the horizontal as soon as the difficult pelvic work is completed. If she be suffering from shock it may be advisable to keep the head slightly lowered throughout.

Abdominal drainage and packing.—Every year drainage is resorted to less and less in gynaecological work. Most of the chronic collections of pus in the pelvis are sterile; but, even if they be not, complete removal of the primary focus and careful cleansing—by dabbing, not rubbing—of the peritoneum in the neighbourhood are probably sufficient to make it quite safe to dispense with drainage; for no further good could be accomplished by such a measure. Large septic cavities must always be efficiently drained, or residual abscesses will form. Packing may be necessary in cases where there is a continual oozing of blood, which cannot be checked. And here it may be pointed out that perfect haemostasis is one of the most essential factors in the success of any operation, for if clots be left they make an excellent culture medium for bacteria: to run the risk, therefore, of having clots is to play into the hands of the enemy. When, however, packing has to be resorted to a strip of gauze passing through a glass tube in the parietes should be used. By the use of a glass tube the withdrawal of the gauze is facilitated. These packs should usually be left in for about forty-eight hours, and then gently withdrawn with the patient under the influence of an anaesthetic.

When a septic area has to be drained it is advisable to enclose a gauze wick in a large, split rubber tube without holes (fig. 299). There should be sufficient gauze to fill the tube and to open the longitudinal slit. The wick projecting from the end of the tube is

spread out in the area to be drained, and the tube itself carried to the surface and fixed to the skin. The pelvis should not be drained through the central incision; a stab wound either on one side or on both should be made outside the rectus sheath, and the tube passed through; with ordinary care the epigastric artery will not be wounded. This method of lateral openings for drainage allows the central wound to heal soundly. Hernia hardly ever occurs through these small stab wounds; whereas this condition is frequently found as a postoperative sequel in cases in which drainage has been carried out through the central incision. As a rule the tube and contained wick can be withdrawn in two or three days and a small strip of gauze inserted

Fig. 299.—The split rubber tube and gauze drain.

for twenty-four hours into the sinus, which will probably soon close. In any case once a connexion with the surface is obtained by which the discharge can escape, the tube or gauze drain is unnecessary, and healing occurs more readily without it. So long as there is any discharge the skin opening must be kept from healing by daily inserting a pair of forceps. During the few days the tube is retained it should be rotated daily to prevent the adhesion of bowel or omentum.

Drainage should never be employed in cases of tuberculous infection of the genital organs or peritoneum, for faecal fistulae, with fatal results, frequently follow such a measure.

So, too, once a faecal fistula has formed in a non-tuberculous case all methods of drainage should at once be abandoned. By so doing rapid closure is generally obtained, if the fistula be not connected with the small bowel.

THE ABDOMINAL INCISION AND THE CLOSURE OF IT.

The usual incision for gynaecological operations carried out by the abdominal route is that known as the 'median subumbilical.'

Some operators prefer an incision made a little to one or other side of the midline, with retraction of the rectus muscle in order to reach the middle of the posterior rectus sheath, which is divided in this line.

By this procedure, after closure of the abdominal cavity, the rectus muscle overlies the incision through the posterior rectus sheath and peritoneum—an advantage in regard to the prevention of subsequent incisional hernia. This, however, is not the simplest method, and it interferes slightly with the manipulations of the operator, so that it will not be further discussed.

The transverse skin incision, with longitudinal division of the other structures, has little to recommend it, except the slighter scar formed by following a line in the skin folds.

The simplest procedure—the direct median incision—if carefully closed in the manner to be described, is quite satisfactory, and hernia very rarely follows in cases in which drainage has not been employed. With the subcutaneous skin suture, to be described directly, the scar is also very slight.

The operator, if right handed, should stand on the patient's left-hand side with the patient placed with her head towards the light, so that in the Trendelenburg position the light may fall into the wound.

When about to commence making the incision the operator steadies the skin of the abdomen by pressing the fingers and thumb of the left hand on the abdominal wall on each side of the middle line. Starting just one finger's breadth above the symphysis pubis a clean incision is made in the middle line through the skin and fat down to the aponeurosis. The incision should always be at least four inches in length; and for difficult hysterectomies, or for the removal of large tumours, it must be further extended according to circumstances. Not only will the length of the incision vary according to the needs of the operation, but also according to whether the patient be fat or thin. It is always best to have a good long incision in order to see what one is doing; two-inch incisions have no advantages and they have many disadvantages.

Any vessels in the subcutaneous tissue which bleed are caught in artery forceps, which are left on for a few minutes. These vessels rarely require ligation.

Next, the aponeurosis is quickly cleared of fat for the whole length of the incision and for about half an inch on each side the middle line; this facilitates the subsequent suturing of it. The median aponeurotic band (linea alba), consisting of the joint tendons of the external and internal obliques and the fascia transversalis, is now divided for the whole length of the incision. If the middle line be not accurately 'struck,' the anterior and posterior layers of the rectus sheath are divided in turn. The extraperitoneal fat now comes into view. This is cut through and the underlying peritoneum picked up and divided between two pairs of forceps, one of which is held by the assistant.

In opening the peritoneum care must be exercised, for it is not uncommon to find the bladder pushed up almost to the umbilicus when there is a large pelvic tumour. Apart from this the tumour itself, or the omentum or even intestine, may be adherent to the peritoneum, and will be incised unless care be taken. In these circumstances the operator must enlarge the incision upwards. Sometimes by working sideways with the finger under the posterior rectus sheath of one side the operator is able to make out the anatomical relations of the condition he is dealing with, and thus find a way into the peritoneal cavity. At other times considerable difficulty is experienced in getting into the peritoneal cavity at all, owing to adhesions, and great judgement and skill may be required to deal successfully with the case (see also tuberculous peritonitis, p. 408) In ordinary cases the peritoneum is opened from the top of the incision to its reflexion on to the bladder. Forceps (fig. 300) are now placed on the edges of the cut peritoneum,

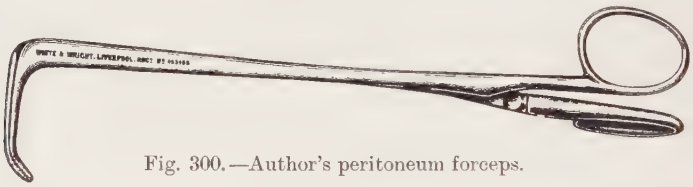


Fig. 300.—Author's peritoneum forceps.

which may be fastened to the skin when there is reason to suspect pelvic infection; or the ring retractor (fig. 301) may be utilized during the removal of infective material through the abdominal wound. In this way the wound is prevented from becoming contaminated.

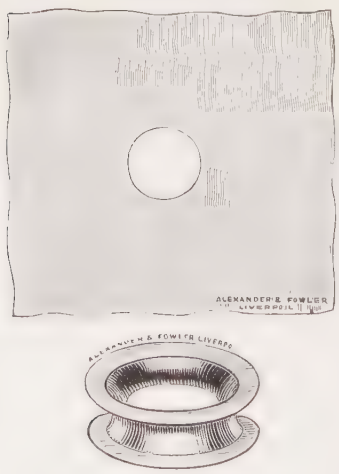


Fig. 301.—Author's ring retractor, with india-rubber sheet, for the protection of the abdominal wound and skin of the abdomen when dealing with intraabdominal septic conditions. (See also figure 320.)

In ordinary circumstances Doyen's retractor (fig. 302)—by far the best instrument for the purpose—is now placed in the lower angle of the wound, and the patient, if necessary, lowered into the Trendelenburg position. The bowels fall back, and are gently and carefully packed off with sterilized gauze which has been wrung out in warm sterile water or—better—sterilized salt solution. In dealing with malignant diseases one should always palpate the lumbar glands before the gauze packs are inserted. The pelvic organs now come into view, and the necessary operation is carried

out with as great speed as is compatible with efficiency. The operation completed, the patient is raised to a very slight Trendelenburg position. Someone now counts, twice over, the dabs, packs and forceps. In private work these should be displayed before the surgeon himself,

Fig. 302.—Doyen's retractor.

and the abdomen should not be closed until he is satisfied that the count is correct. A very large number of eminent surgeons have been guilty of leaving instruments or dabs inside the abdomen, but this is no excuse for the beginner to do likewise; rather is it all the more reason for the exercise of extreme care. Such an accident may cost a surgeon considerably more than his reputation.

The closure of the abdominal wound is now carried out. The peritoneal incision is closed with catgut threaded on a large slightly curved round-bodied needle; any sort of running stitch, which turns

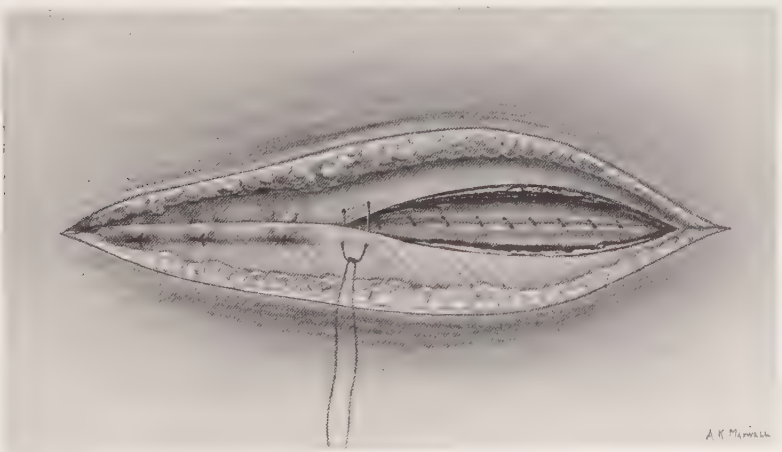


Fig. 303.—Closure of the abdominal wound. Approximation of the aponeurosis with overlapping sutures. Deeper in the peritoneum is seen closed by an ordinary overhand suture, but the cut edges are wrongly shown turned inwards.

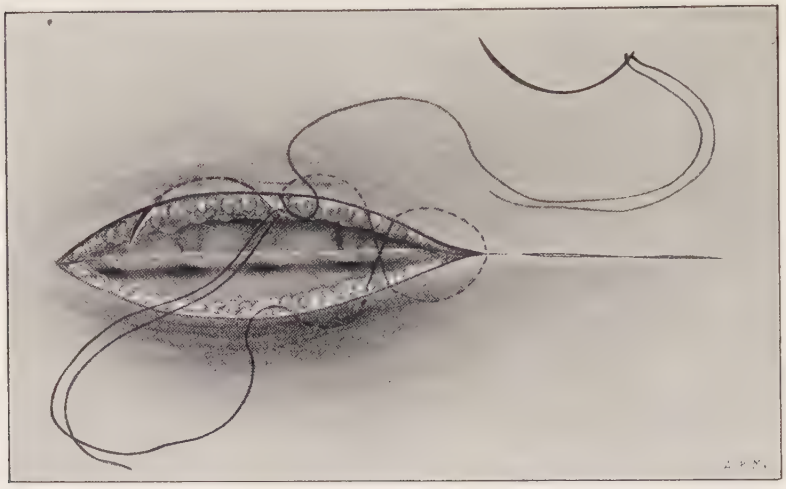


Fig. 304 A.—The 'bootlace' subcutaneous suture drawn tight in the upper part of its course. The illustration also shows the method of insertion of the stitches.

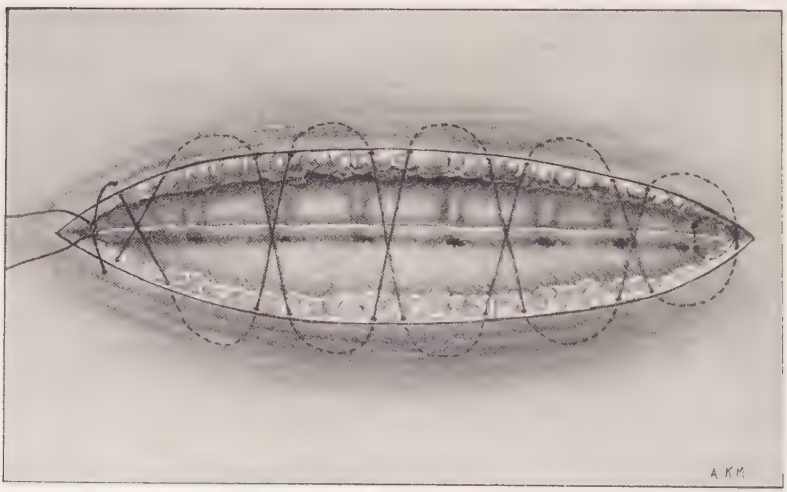


Fig. 304 B.—The 'bootlace' subcutaneous method of skin suture. The illustration shows the method of commencing and finishing the suture, with the stitches not drawn tight.

the cut edges outwards and brings the smooth peritoneal surfaces into close apposition, may be used. This accomplished, the divided aponeurosis must be very carefully coapted if a good scar is to be obtained and the risk of incisional hernia avoided. It is best to use stout (No. 3 '20-day') chromicized gut, and the edges of the aponeurosis should be made to overlap: this can be effected by means

of a continuous overlapping suture, or better, by an interrupted one, such as is shown in figure 303.

If the abdominal wall be very fat it is advisable to place three or four silk-worm gut sutures through the skin and whole depth of the fat, before inserting the subcutaneous skin suture. If it should be necessary to use the silk-worm gut sutures they are tied last of all, being held in the meantime by artery forceps on each side of the wound. In thin women there is no need to do more than insert the subcutaneous suture after the aponeurosis has been dealt with. This subcutaneous suture should be of catgut—No. 1 or No. 2 chromicized is the best. Many surgeons employ a single to-and-fro stitch, but the author has found that a 'bootlace stitch' answers the purpose better. To insert this suture, two large slightly curved reverse-Hagedorn needles are threaded with a piece of catgut of suitable length. Each in turn is first passed through the aponeurosis and fat at the upper end of the wound, and out exactly at the angle of the skin incision. Each is then made to take a curved sweep just beneath the skin, first on one side of the wound and then on the other. The length of each stitch should be half an inch (fig. 304 A and B). If the incision be a long one, when half the wound is closed the stitches are drawn up moderately tightly, and tied. The rest of the wound is then closed without cutting the suture, which is finally made to emerge through the skin on each side close to the lower angle of the wound, and tied. If this method of suture be properly carried out hardly any scar results.

In those cases in which the abdomen has to be closed rapidly, owing to the condition of the patient, sutures of silk-worm gut which include all the layers of the abdominal parietes may be used.

ABDOMINAL HYSTERECTOMY.

Removal of the uterus is undertaken for malignant and innocent growths; for any disease such as tuberculosis; for acute infection, or other conditions of sufficient importance or severity to justify such a serious measure. This operation may, then, be performed as a carefully thought out procedure, as in cases of cancer of the cervix; or it may be carried out as an emergency operation in the case of acute septic infection or rupture of the uterus in parturition.

Only the general principles embodied in this operation will be described here. Generally speaking abdominal hysterectomy may be carried out in one of the following three ways:

(1) Panhysterectomy.
(2) Panhysterectomy with pelvic dissection.
(3) Supravaginal hysterectomy.

Panhysterectomy is the operation for the removal of the whole uterus alone or with the appendages. It is used for cases of fibromyomata uteri (by some surgeons); for carcinoma limited to the body of the uterus; for tuberculosis of the uterus; for septic and for ruptured uteri. The operation is performed in the following manner.

With the uterus well in view the fundus is seized by the operator, and the organ delivered out of the abdominal wound, if this be possible. Strong catgut ligatures are then passed with a curved pedicle needle (fig. 305), underneath the infundibulo-pelvic ligament on each side if

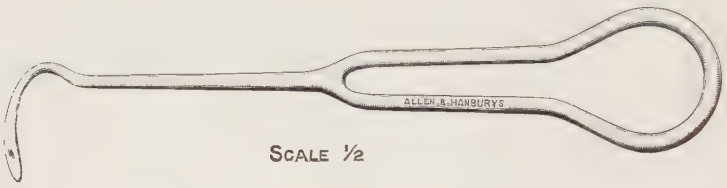


Fig. 305.—Pedicle needle.

the ovaries are to be removed, or between the uterus and ovaries if they are to be left along with the Fallopian tubes. These ligatures are then firmly tied. A ligature is next passed under the round ligaments on each side, and tied about two inches away from the uterus. A stout silk ligature, temporarily to check the bleeding from the uterus, is then passed close to that organ beneath the tube and ovarian ligament, including the round ligament on each side, and tied. Or forceps may be placed over the tubes and down the sides of the uterus to prevent haemorrhage from that organ. In figure 306 forceps are seen in place on one side of the uterus and a ligature on the other. In this figure also ligatures are seen in position on the round ligaments: and on one side between the ovary, which is to be left, and the uterus, and on the other side on the infundibulo-pelvic ligament.

With scissors the structures between the ligatures, or ligatures and forceps, are then cut through, and the peritoneum is divided across the front of the uterus as low as the vesical reflexion. With a gauze dab the bladder is now pushed away from the front of the supravaginal cervix until the vagina is reached. Next, the posterior layer of the broad ligament is divided with scissors close to the uterus down to the utero-sacral ligaments, for which ligatures may be required. So far there should have been no haemorrhage.

The next step is to secure the uterine artery on each side. This should be done well out towards the pelvic wall, in order to be able to place the ligature on the artery before the cervical and vaginal branches are given off. If this be not done much annoying haemor-

rhage may occur from these branches when they are cut through a little later. Having tied the arteries, after tracing them by dissection with the forceps in the anterior portion of the cellular tissue of the broad ligament—back from the uterus and over the ureter to the pelvic wall—the operator cuts boldly down, close beside the cervix in order to avoid injuring the ureter, until the vagina is reached. This is opened in front and the uterus rapidly freed all round with

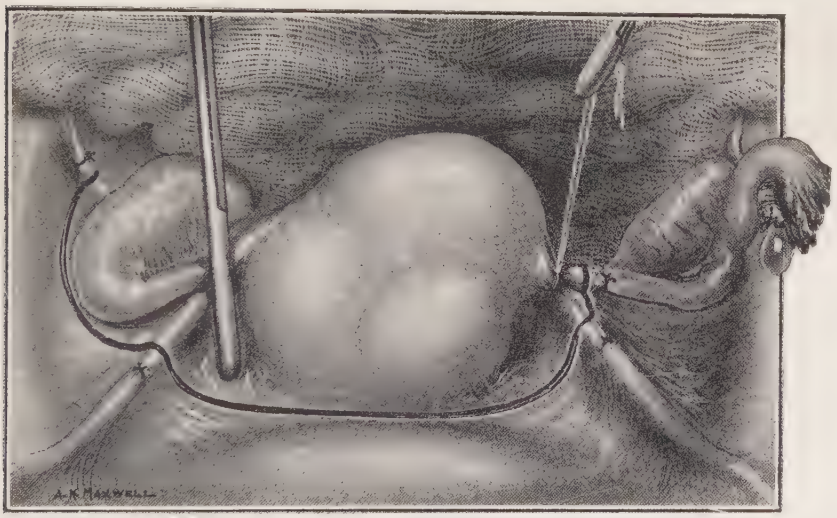


Fig. 306.—In this illustration the bladder is seen below, the gauze being packed in behind the uterus. The peritoneum is shown cut through at the sides and in front of the uterus. On the right side of the pelvis the infundibulo-pelvic and round ligaments are tied and the tube and round ligament clamped close to the uterus by compression forceps; the tube and ovary will be removed on this side. On the left side of the pelvis ligatures have been placed on the round ligament and around the Fallopian tube and ovarian ligament, in order that these structures may be left. On this side a ligature has been placed close to the uterus to encircle the round ligament, tube, and ovarian ligament and so temporarily control haemorrhage from the uterus.

scissors. The edges of the vagina—anterior and posterior—are then secured with forceps, and a dab pushed down into the vaginal canal. All bleeding points are now seized with artery forceps and ligated; and if drainage be unnecessary the vaginal vault is closed with catgut sutures, with the assistance of a needle holder (fig. 307) and a long pair of dissecting forceps. The next step is to sew the anterior and posterior cut edges of the pelvic peritoneum together (fig. 308). The operation is then completed by the closure of the abdominal incision.

Panhysterectomy with pelvic dissection is commonly known as **Wertheim's operation**, for it was this surgeon who first impressed on

the profession the claims of the extensive procedures involved. It is only performed for the eradication of malignant diseases of the uterus. It differs from ordinary panhysterectomy in that the cellular tissue

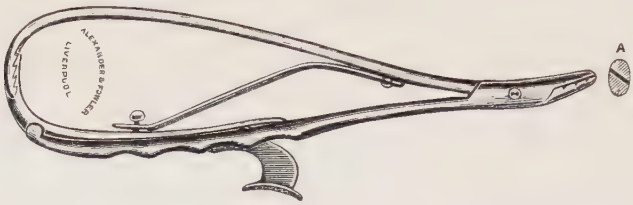


Fig. 307.—Author's needle-holder for any form of needle. A is a section of the beak showing the biting surfaces at an angle, as introduced by Arbuthnot Lane, for deep pelvic work.

of the pelvis and the pelvic glands are removed, together with the ovaries, tubes, and a large cuff of vagina which is clamped—enclosing the diseased cervix—with special instruments before division. Figure 257 is a drawing of the uterus, glands and cellular tissue removed by this

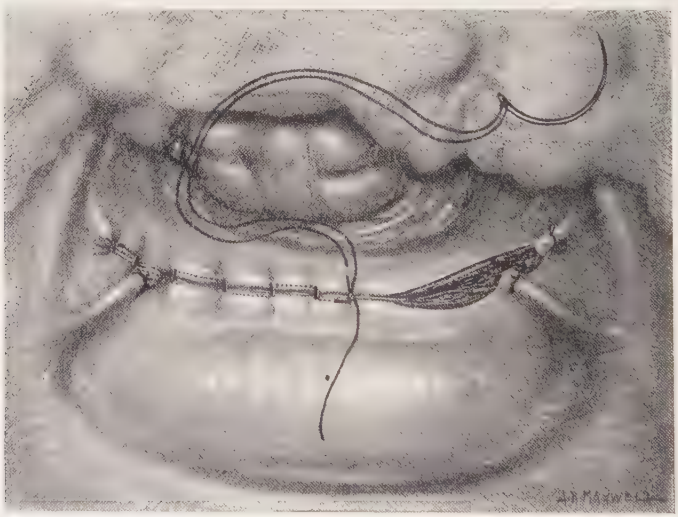


Fig. 308.—Abdominal hysterectomy. Suture of the peritoneal flaps across the floor of the pelvis. It will be noticed that all stumps are turned in.

method. The operation is a most difficult and dangerous one even in skilled hands, and should not be undertaken lightly. The main dangers arise from haemorrhage, shock, sepsis, and injury to the ureters. It is, however, the operation of the future for cancer of the cervix, since it offers the best prospect of the cure of what must otherwise be a fatal disease.

The commencement of the operation is the same as for ordinary panhysterectomy. After the peritoneal flaps have been marked out in front and behind the uterus, the operator with his fingers separates from the sides of the pelvis all the cellular tissue in the broad ligaments. When the uterine arteries are reached they are tied close to the pelvic wall. The ureters are next dissected out and freed for the whole of their course in the broad ligaments, care being taken not to injure the coats of these ducts. The main venous trunks are usually ligated during this procedure. When all the cellular tissue has been separated from the ureters it is gathered in and removed in one piece with the uterus. The final step in the removal is effected by cutting through the vagina between two pairs of clamps. Great care must be taken in lifting the uterus out of the abdomen, lest the wound be infected by touching it with the cut edges of the vagina.

Supravaginal hysterectomy consists of the removal of the whole or a portion of the *body* of the uterus alone or with the appendages. It should only be employed for dealing with innocent conditions, and, as already mentioned, every uterus so removed should be immediately opened by someone not taking part in the operation; for it is not uncommon to find carcinoma of the body of the uterus associated with fibromyomata. If this complication be found the cervix should also be removed together with the ovaries and tubes.

The modern operation of supravaginal hysterectomy can usually be easily and quickly performed; sometimes, however, great difficulty may be experienced.

The first steps of the operation are precisely the same as for a panhysterectomy. But when it comes to the ligation of the uterine artery, this can be accomplished by tying the vessel as it runs along the side of the uterus a little above the level of the internal os uteri.

The uterus is amputated above the ligatures by a circular incision (fig. 309), and the stump seized in a strong volsellum (fig. 310) in order that all bleeding points may be carefully inspected and, if necessary, ligated.

When the patient is under forty years of age an attempt should be made to save a small portion of the body of the uterus together with some endometrium, if the position of the growth permit. If this be done, the patient will menstruate regularly afterwards—a state of affairs that greatly benefits her general health and prevents atrophy of the ovaries, which usually occurs after complete removal of the uterus. The cervical stump is next sewn across with two or three mattress sutures of catgut to stop any oozing there may be. The

operation is then completed by the suture of the peritoneal flaps, and the closure of the abdomen.

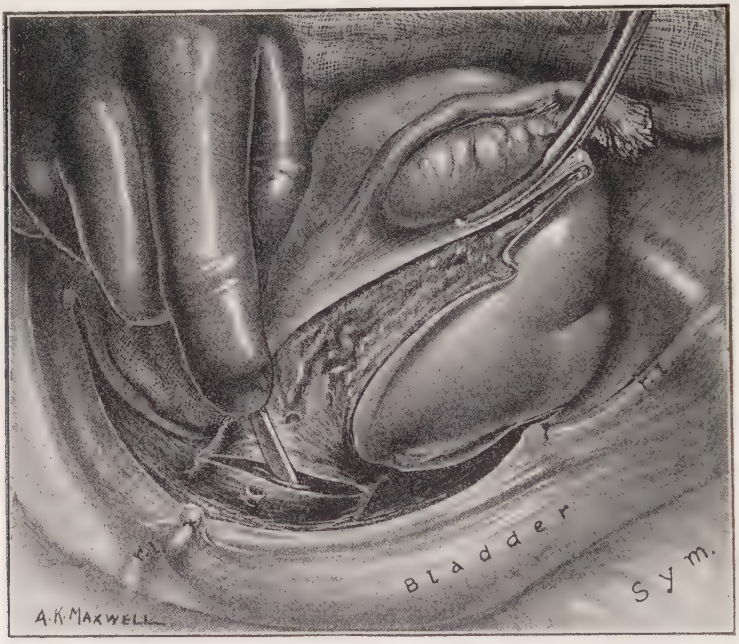


Fig. 309.—Supravaginal hysterectomy. In the illustration the ligated uterine artery on the right side has been cut through, and the supravaginal cervix is being cut across while the uterus is being dragged over to the opposite side.

Many cases are not quite so simple as the above description might lead one to suppose. Large and irregular tumours may disarrange the order of anatomical relationships; or it may be necessary

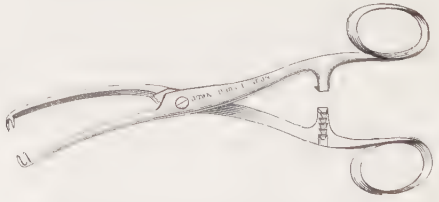


Fig. 310.—Strong volsellum forceps.

to shell out a large fibromyoma from the broad ligament, in which case great care must be exercised lest the ureter be injured. Again, there may be associated tubal or appendix disease, with dense adhesions which may seriously complicate the operation.

MYOMECTOMY.

The enucleation of fibromyomata from the wall of the uterus should not be practised when there is a large number of growths present. In such cases hysterectomy is the only satisfactory operation. If there be only one, or possibly two, growths of moderate size to be seen it may be advisable to do no more than enucleate them. Also, sometimes during pregnancy it may be found necessary to remove a fibromyomatous growth which is undergoing degeneration and causing pain and toxaemic symptoms. During pregnancy, of course, enucleation can only be safely practised when the tumour is subperitoneal.

The chief difficulties of enucleation arise from the uterine bleeding and from retraction of the flaps. It is quite remarkable how quickly the uterine muscle, when cut into, retracts from the surface of a fibromyoma projecting on the peritoneal surface. For this reason, unless the tumour be large and have a definite pedicle, a linear incision should be made across the summit and down to the growth which

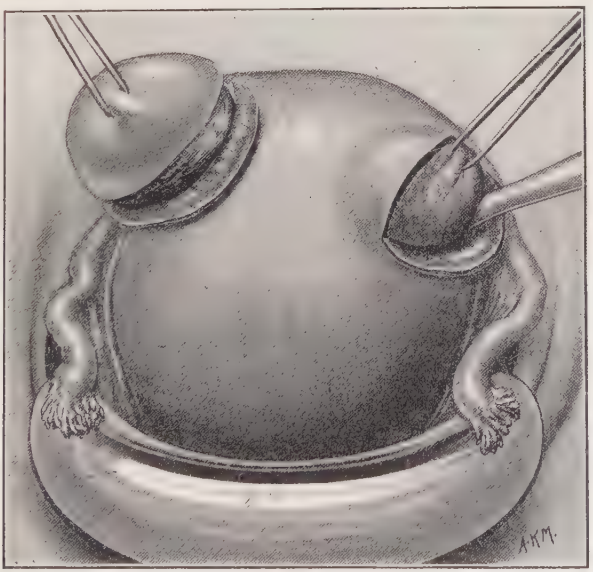


Fig. 311.—Myomectomy. On the right side of the illustration a small subserous fibromyoma is being enucleated after a linear incision has been made over the top of it. On the left side a subserous fibromyoma is partially enucleated after a circular incision has been made round it.

is then easily shelled out (fig. 311). In very large, more or less pedunculated growths a circular incision may be necessary, and this should be made a little way up the side of the tumour.

After the growth has been enucleated the deeper parts of the cavity are closed by a few mattress sutures of catgut, running from peritoneal surface to peritoneal surface, and passing under the floor of the cavity; when these have been tied the flaps are trimmed and the peritoneal surfaces united with a fine catgut suture.

HYSTEROPEXY (Ventrifixation).

Suture of the uterus to the abdominal wall for the cure of prolapse and retroversion is not practised so much as formerly for the reasons

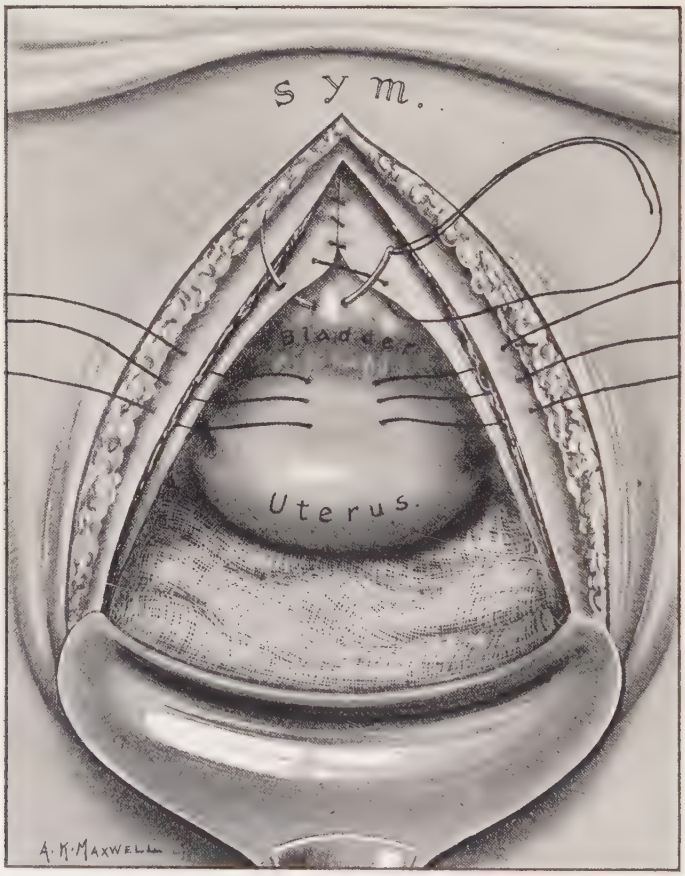


Fig. 312.—Hysteropexy. The figure shows the bladder being sewn to the parietal peritoneum in order to prevent a hole being formed through which bowel might pass. The stitches through the anterior wall of the uterus and aponeurosis are placed ready to be tied.

already given (p. 164), but it may sometimes be indicated for the relief of prolapse in old women.

It is best performed in the following manner. The uterus is secured and brought well up into the abdominal wound. The peritoneum on the summit of the bladder as far back as the utero-vesical reflexion is then sutured to the parietal peritoneum at the lower part of the wound. Three strong chromic catgut sutures are now passed through the anterior surface of the uterus, about one quarter of an inch apart, and with a bite half an inch in width, commencing below at the utero-vesical peritoneal reflexion. By these the uterus is drawn up to the surface exactly at the lower angle of the unsutured parietal peritoneum (fig. 312). The stitches in the uterine wall are then passed through the aponeurosis on either side, missing the peritoneum which is closed above them; in this way a small area of the anterior wall of the uterus is sutured directly to the aponeurosis, the peritoneum, closed above and below this area, fitting tightly round the sutured surface. The cut edges of the aponeurosis are now made to overlap and are sutured in the manner which has already been described; and then the sutures which have been passed through the anterior wall of the uterus and the aponeurosis are tied. The skin incision is closed in the usual way.

OPERATIONS ON THE LIGAMENTS OF THE UTERUS.

These include operations on the round and on the utero-sacral ligaments. Many operations on the round ligaments have been devised in order to correct backward displacements and prolapses; of these four will be described here.

Gilliam's operation.—This operation is employed by most of the best operators in America; and the author has, after an extensive trial, become convinced of its merits. It is carried out as follows.

After the abdomen has been opened, and all adhesions and disease dealt with (which, of course, applies equally to all cases where the abdomen is opened), a stout silk ligature is passed under each round ligament about half way between the pelvic brim and the uterus. A pair of curved ligature forceps is then passed over the recti and under the aponeurosis in young people, or directly through the aponeurosis outside the recti under the skin and fat in elderly women, and the parietal peritoneum having been pierced the ligatures on the round ligaments are seized on each side in turn and drawn out through the wall into the abdominal incision (fig. 313 A). Traction made on the ligature causes a loop of the round ligament to follow through (fig. 313 B). These loops

are drawn well across and stitched on to the aponeurosis on the opposite side of the midline in order to draw the divided aponeurosis together. The wound is then closed. It is better not to stitch the loops together, for such a procedure may cause a sense of great tightness and dragging, and in pregnancy is apt to cause some bladder irritation.

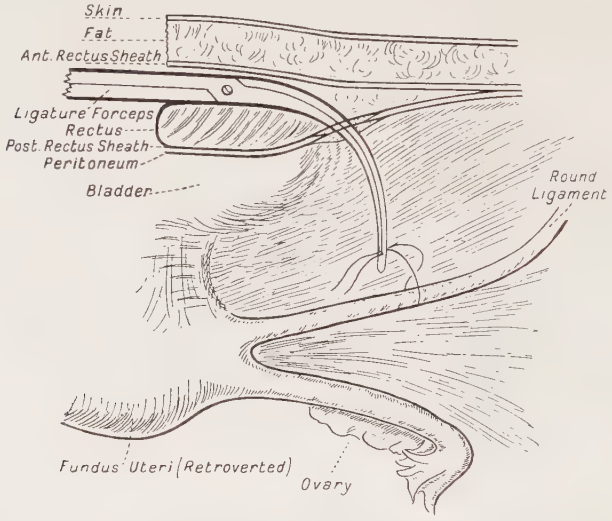


Fig. 313 A. —Diagram to show Gilliam's operation—first stage.

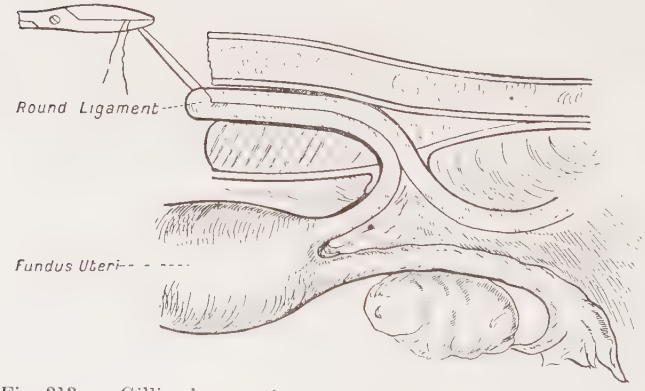


Fig. 313 B.—Gilliam's operation—second stage. (*From an article by the author in the 'Practitioner.'*)

In this way the uterus is suspended close to the anterior abdominal wall by the looping and shortening of the round ligaments; the natural position is obtained and there is no subsequent danger during pregnancy, nor does relapse occur.

The 'sling' operation.—After the abdomen is opened a stout silk ligature is passed round each round ligament about two inches from the uterine attachment. The uterus is then grasped with the finger-grip forceps (fig. 314) and held forwards; a pair of ligature forceps is

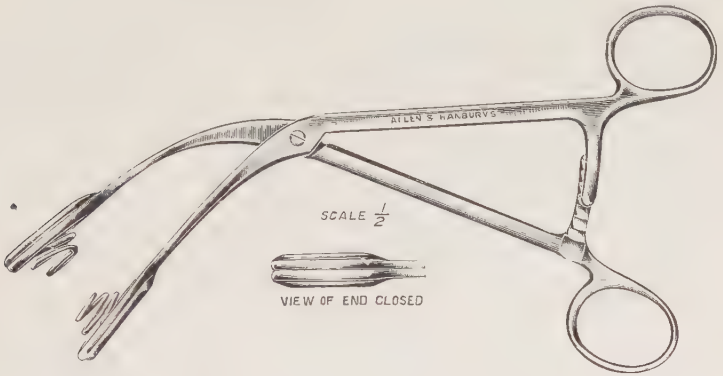


Fig. 314.—Author's 'finger-grip' forceps. Before using the ends should be enclosed in gauze to give a better grip.

next thrust through the broad ligament from behind forwards on each side, passing from a little above the level of the internal os behind to the spot where the ligature has been placed round the ligament (fig. 315 A). These ligatures are seized in the forceps, and, by means of them, loops of the round ligaments are dragged through the broad ligament (fig. 315 B) and stitched to the posterior surface of the uterus near the midline. They should not be absolutely stitched together, but a supporting loop of catgut may temporarily connect them.

The uterus is thus bent forwards and kept up and forwards in a sling.

Intraperitoneal shortening of the round ligaments.—This has been used in cases of retroversion, but it is not nearly so efficacious as either of the methods already described. When, however, one round ligament has been shortened in the course of an operation—as for instance in the removal of a growth from this structure—it is advisable to shorten the other also. This is best done by the method that is known as Wylie's. This procedure simply consists in folding the round ligament on itself and stitching it in position (fig. 316).

Alexander-Adams operation.—This procedure must be briefly mentioned, more because it is classical and still employed by many operators, than because it deserves to retain its place as an operation of election. It is only useful in cases of simple mobile retroversion,

many of which, however, give rise to no symptoms. Since it is carried out without opening the peritoneal cavity adhesions and other complications cannot be dealt with.

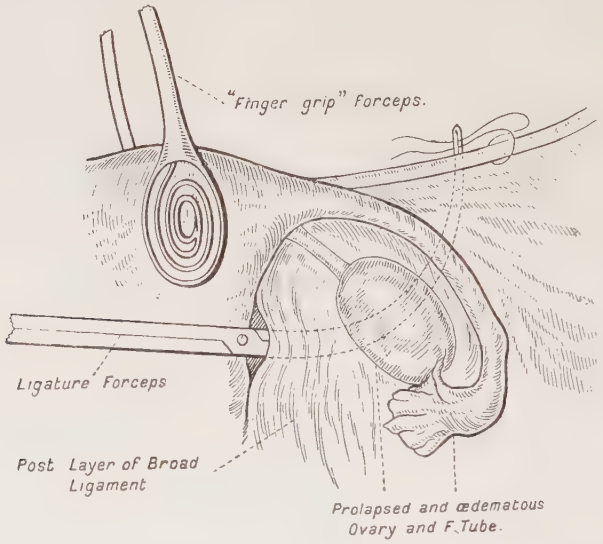


Fig. 315 A.—Diagram to show 'sling' operation—first stage.

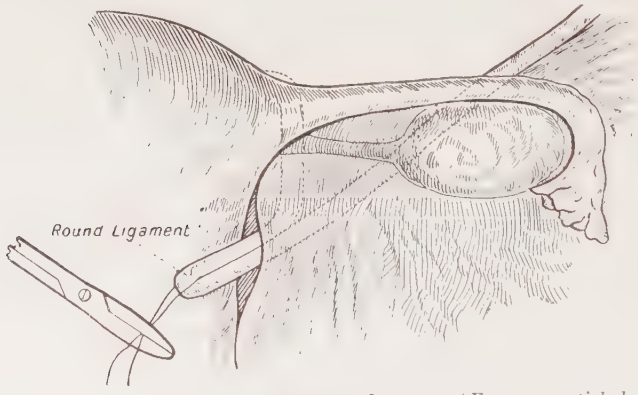


Fig. 315 B.—'Sling' operation—second stage. (*From an article by the author in the 'Practitioner.'*)

The operation is performed by making an oblique incision over the external abdominal ring on each side. The external oblique fascia is then slit up for about an inch, and the round ligament isolated. Traction is now made on this structure on each side until the peritoneal cuff or reflexion comes into view. The round ligaments are then stitched to the aponeuroses, and thus prevented from slipping back.

The divided aponeuroses are approximated with catgut sutures, and the wounds closed.

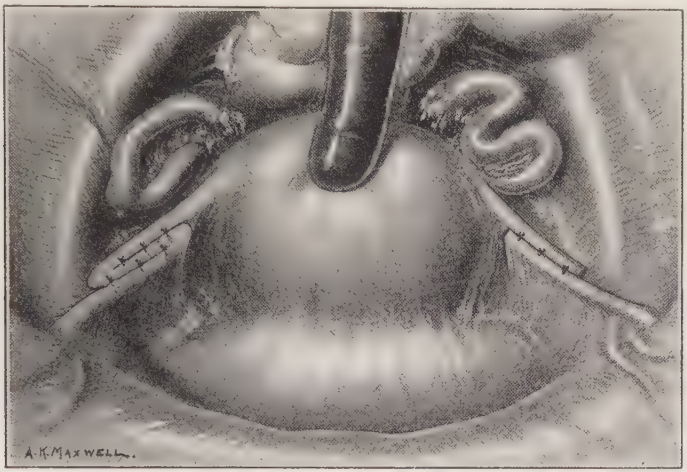


Fig. 316.—Wylie's method for intraperitoneal shortening of the round ligament is shown on the left side of the illustration. On the right side lateral apposition of the divided ligament (as after the removal of a tumour) is seen.

Shortening of the utero-sacral ligaments.—The operation for shortening the utero-sacral ligaments by the abdominal route is performed in cases of prolapse, and sometimes in retroversion, when it is found that these structures are much relaxed.

If the uterus be suspended by Gilliam's method in a bad case of prolapse, without shortening these ligaments, the cervix of the uterus is apt to swing close up to the symphysis pubis, giving rise to bladder irritability. By the shortening of the utero-sacral ligaments the cervix is suspended in the middle of the pelvis.

The operation is very simple. With two fingers of the left hand, or with the pelvic retractor (fig. 317), the uterus is dragged upwards and forwards under the pubic arch, exposing widely the pouch of Douglas. The utero-sacral folds of peritoneum can be identified in almost every case, no matter how stretched they may be. With rat-tooth catch forceps the operator then picks up the peritoneum on each side, at the points where the utero-sacral ligaments end on the uterine surface in front, and at the side of the sacrum behind on each side of the rectum. In this way landmarks

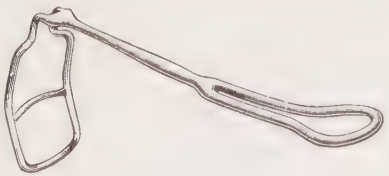


Fig. 317.—Author's pelvic retractor.

are established. While the assistant holds the forceps apart on one side the operator passes an 'in and out' suture of fine silk the whole length, or in some cases along a portion, of each ligament (fig. 318). The ends of this suture are then tied together on each side; by this means the utero-sacral ligaments are shortened to the desired extent.

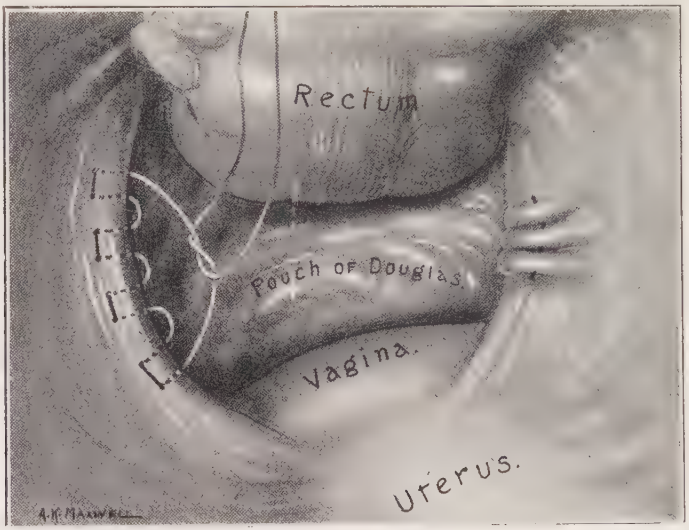


Fig. 318.—Method of shortening the utero-sacral ligaments. In the illustration only a portion of the ligaments is shortened.

ABDOMINAL CAESAREAN SECTION.

Although, strictly, this operation may be said to belong to the department of obstetrics, it naturally falls within the domain of gynaecological surgery, so that some brief account of this important operation is called for, especially as it is the operation of choice in a variety of circumstances. A large abdominal incision is necessary through which most operators deliver the pregnant uterus, but some do not. If the organ be delivered the abdominal cavity can be packed off more effectually, and bleeding more readily controlled. In either case the uterus should be steadied by the assistant, while the operator starting just below the fundus cuts through the wall in the anterior midline with a clean incision, about six inches in length, down to the membranes. These are rapidly torn through, and if the placenta be in front it is separated immediately, a leg seized, the child delivered and the umbilical cord divided between two pairs of forceps. The infant is then handed over to the care of an assistant. In the majority of cases the placenta is situated upon the posterior wall of

the uterus, and is, therefore, separated after the extraction and separation of the child. The removal of the placenta and membranes must be carefully carried out, the assistant kneading the uterus the while to promote contractions. At this juncture the anaesthetist should administer hypodermically 1 c.c. of infundibular extract, or a dose of ergotine.

Before closing the incision into the uterus the operator must not neglect to pass two fingers down through the cervix. If the cervix be rigid and undilated, dilators, which should always be at hand, must be used to insure free drainage by way of the vagina. A gauze wick is placed in the uterus, and passed through the cervix into the vagina. This gauze drain should be removed twelve hours later. The incision in the uterine wall will now be seen to form quite a small wound, owing to the retraction of the muscle fibres. Interrupted sutures of chromic catgut (No. 3) should be used to secure apposition of the muscle walls, and these sutures should pass from side to side through the peritoneum and muscle layers without penetrating the endometrium. Careful coaptation of the peritoneum with a fine catgut continuous suture completes the operation, except for the closure of the abdominal incision which is carried out in the ordinary manner.

OÖPHORECTOMY ('Ovariotomy').

Removal of the ovary alone is rarely practised except for gross disease of this organ. Formerly the ovaries were removed in the belief that such a procedure caused shrinkage of fibromyomatous tumours, such as was supposed to occur naturally at the menopause. This is never done now.

Investigations may, however, show—as, indeed, in the opinion of some they do now indicate—that it may be not only permissible, but advisable, to remove one ovary for the relief of conditions depending on ovarian hypersecretion, just as part of a thyroid gland is frequently removed for hyperthyroidism.

The removal of ovaries is part of the operation for malignant disease of the uterus; and it may of necessity form part of the operation for the removal of inflamed or diseased tubes, as will be described presently. Here we are only concerned with the simple removal of the ovary for the conditions already indicated under the diseases of this organ.

Oöphorectomy is simple or complicated according to the size and situation of the tumour to be dealt with and the adhesions attached to it.

Owing to the frequency with which malignant changes occur in all ovarian cysts found in women over forty years of age, and, more rarely, even in younger women, an attempt should be made to remove these growths entire and without drawing off their fluid contents with a

trocar. Even when otherwise innocent the cyst may be papillomatous, and, if punctured, implantation on the peritoneum may follow. To carry out complete removal a very long incision—sometimes extending from the symphysis pubis to the ensiform cartilage—may be necessary. Occasionally, however, an ovarian cyst ruptures spontaneously before operation. In these cases the peritoneal cavity must be carefully cleansed out with dabs after the removal of the cyst.

Adhesions may be found as the result of inflammatory or other changes in the cyst wall, and these are protective, but may cause difficulty to the operator. Rotation of the cyst (twisted pedicle) is a frequent cause of these complications.

If the omentum be densely adherent it should be completely tied off in segments and cut through close to the tumour with scissors. Other adhesions, such as those connected with the bowel, must be carefully separated with the fingers, which are inserted into a plane of cleavage and passed slowly, gently and steadily over the whole surface of the tumour—the palm of the hand lying on the convexity of the cyst or growth. Sometimes it is a good plan to brush off adherent bowel with a dab. As soon as it is free the growth is lifted through the abdominal wound entire; the intestines are then packed off, and the pedicle of the tumour is clamped and cut through with scissors.

To ligate the pedicle a stout catgut ligature is passed through the middle of it, underneath the clamp forceps and by means of the pedicle

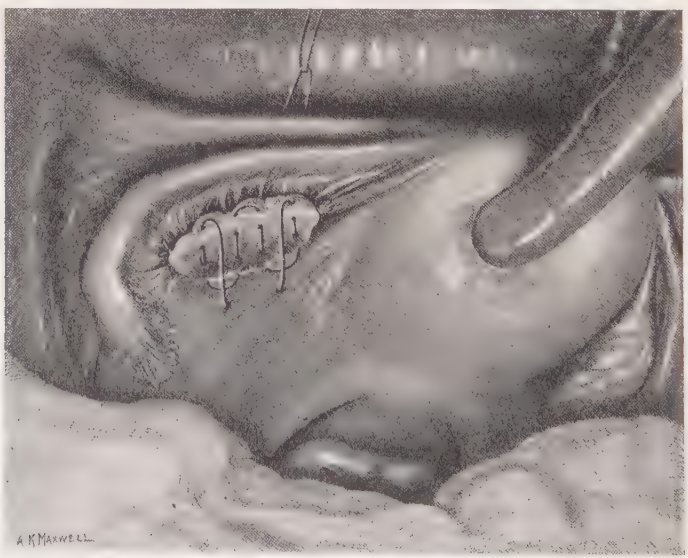


Fig. 319.—Method of suturing and 'turning in' the stump after oöphorectomy.

needle. This ligature is cut at the loop and the pedicle tied in two halves. Another ligature is then placed as an additional precaution round the infundibulo-pelvic ligament of the same side, to secure the ovarian vessels. The broad raw pedicle must not be left exposed, for bowel may become attached to it and give rise subsequently to intestinal obstruction, owing to kinking or twisting. The neatest and quickest way of dealing with the stump is to turn its sutured surface on to the back of the broad ligament underneath the Fallopian tube. This is readily accomplished by drawing the edges of the stump together with a suture of catgut, the ends of which are carried through the broad ligament, from behind forwards, and tied together in front of the round ligament, on the anterior surface of the broad ligament (fig. 319).

The ovary on the other side must always be examined, and, if found diseased, removed or dealt with in the manner to be now described.

RESECTION OF THE OVARY.

This operation should always be employed instead of complete oöphorectomy when it is possible to dissect a small innocent cyst from the ovary, or when dealing with inflammatory lesions. This is more especially the case when the ovary of the other side has been removed in a woman under forty years of age. Resection should never be practised, of course, in dealing with malignant disease.

In the performance of resection a wedge-shaped piece of the ovary is removed and the raw surfaces are sewn together with fine catgut. Sometimes when this has been done excessive haemorrhagic oozing compels the operator to remove the remaining portion of ovarian substance. But before resorting to this he should tie the ovarian vessels to see if that will stop the bleeding; if so, the remaining portion of the ovary should be left, for it will probably remain functional so far as its internal secretion is concerned even after the main blood supply has been cut off.

There are some, however, who believe that when the blood supply is cut off the ovary atrophies. This is certainly not often the case, for adhesions form and bring a fresh supply. In any case no harm is done and it is preferable to complete removal of the organ.

REMOVAL OF BROAD LIGAMENT CYSTS.

Parovarian cysts often have a distinct pedicle even though it be broad, and they can be removed exactly as though they were ovarian cysts. Sometimes, however, they are sessile, and in these circumstances

it is best to divide the peritoneum close to the base of the cyst, tie the vessels, remove the cyst and then close the peritoneum with a continuous suture of fine catgut.

Other broad ligament cysts must be removed by dividing the overlying peritoneum and by shelling out the tumour. Great care must be taken not to rupture these cysts, for they frequently contain papillomata. The peritoneum is subsequently closed with a continuous suture of fine catgut.

SALPINGECTOMY.

The removal of the tubes is carried out for growths, infections, and for tubal pregnancy.

The operation is quite simple if the tubes be free, but adhesions to the rectum, with extratubal abscesses, may make the operation a formidable and dangerous one. Fortunately the pus found in pyosalpinges is usually sterile.

The tube is freed from adhesions by gradually insinuating the finger or fingers along the planes of least resistance. If the fundus uteri can be located it is a good plan to work down the back of the uterus to Douglas' pouch. When this is reached the hole made by the fingers is widened laterally, and the ovaries and infundibular portion of the tubes felt for on the back of the broad ligament. Once located it is not a difficult matter to unfold, as it were, the adherent tubes and ovaries by working with the palmar surface of the tips of the fingers gradually up the back of the broad ligament. In this way the ovaries and tubes can gradually be scraped off into the palm of the hand and delivered through the abdominal incision. As already pointed out, in cases of infection with the presence of pus the abdominal cavity must be carefully packed off and the edges of the abdominal wound protected; the latter can be effectually accomplished with the ring retractor (fig. 320).

If the ovary be oedematous, but do not contain an abscess, it should not be removed.

The tube is best excised in the following manner. The uterine end is cut out of the uterus by means of a wedge-shaped incision (fig. 321) and the artery at the lower angle caught and tied. The remainder of the tube is removed with scissors by cutting along the top of the broad ligament, and the vessels secured after they have been cut through. The wound in the uterus is closed with two or three interrupted catgut sutures and the top of the broad ligament sewn together with an ordinary overhand, or folding-in, suture.

If the ovary tend to drop down after the removal of the tube it should be sutured to the infundibulo-pelvic ligament laterally or to the round ligament in front.

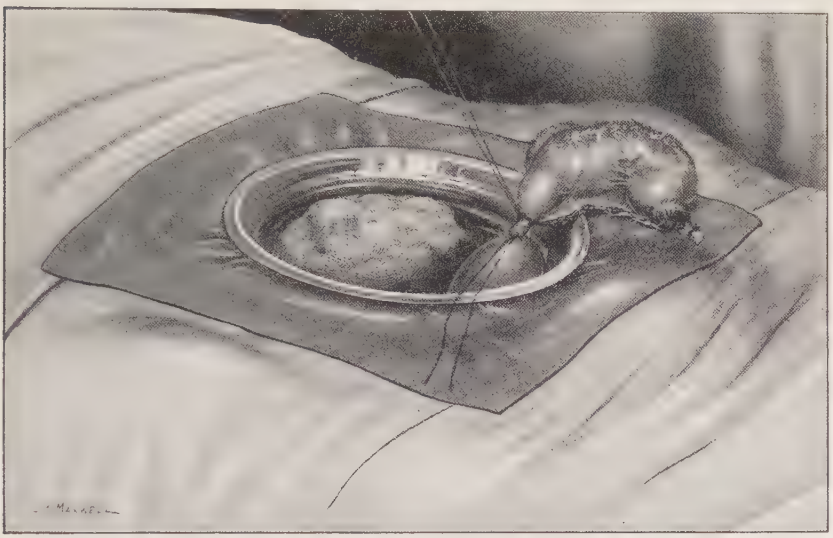


Fig. 320.—The author's ring retractor and rubber sheet in use, and protecting the abdominal wound and neighbouring parts and coverings from infection. The operation shown is for the removal of a pyosalpinx.

In cases in which there is no infection of the tubes, such as those of early tubal pregnancy, and in which speed may be a desideratum, a

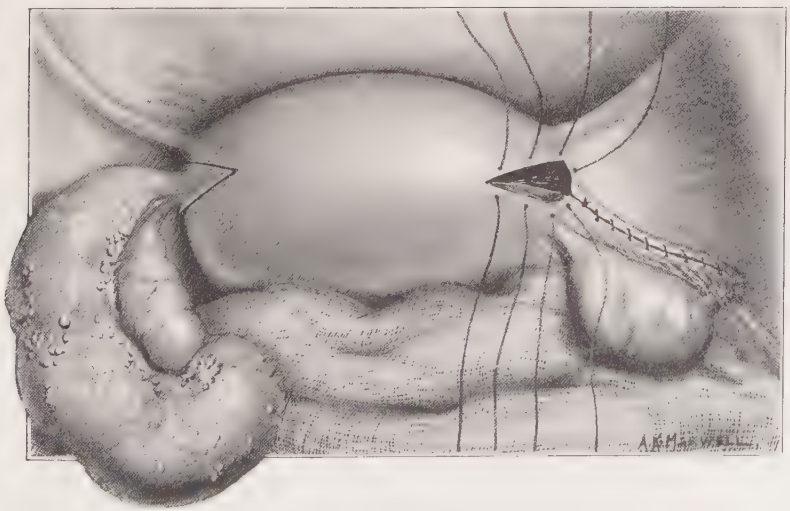


Fig. 321.—Salpingectomy, with the removal of a wedge-shaped piece of the uterine cornu.

suture may be passed through the broad ligament below the tube, cut through at the loop and tied each way; the tube is then rapidly removed with scissors. This method of removal is also sometimes adopted when the tube and ovary are removed at the same time (salpingo-oöphorectomy), the double ligature being passed through the broad ligament below the ovary. In these cases it is a wise precaution to tie a ligature round the infundibulo-pelvic ligament as well.

§ iii. VULVAL AND VAGINAL OPERATIONS.

In operations on the vulva and vagina the patient is placed in what is known as the **lithotomy position**.

There are many ways of maintaining the patient in this position. On hospital tables there are usually pillars with stirrups attached to support the legs in a flexed and abducted position. But a very simple and convenient apparatus, whether for hospital or private use, is that known as Clover's crutch (fig. 322).

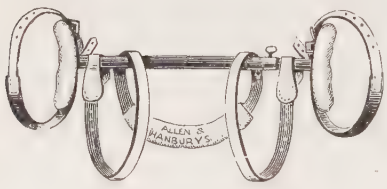


Fig. 322.—Clover's crutch for the lithotomy position.

When the patient is fully under the influence of the anaesthetic the circular leg straps are fixed below the knees and the long strap is passed over the one shoulder and under the other, the two free ends being then fixed to buckles attached to the crutch at each end of the central rod. By means of this strap the legs are drawn up towards the chest. The central rod is telescopic so that the legs can be separated according to requirements. The patient's buttocks are lifted down to the end of the table, and rest inside the inflated rim of a Kelly's bag (fig. 323) which drains into a bucket at the foot of the table. The external genitals, buttocks and thighs are now thoroughly washed with a 1–500 solution of biniodide of mercury in spirit. A Sims' speculum is passed into the vagina, which is recleansed by swabbing with wool soaked in the biniodide solution.

Fig. 323.—Kelly's bag—for use with the lithotomy position.

The lower part of the legs and feet (which should be clad in warm woollen socks) are enclosed in sterilized calico leggings. A specially-shaped sterilized apron is then tied round the knees. When this is hanging in

position only the vulva and anus are exposed. The ends of the apron are then tucked tightly under the buttocks. The appearance of the patient thus prepared for operation is shown in figure 324.

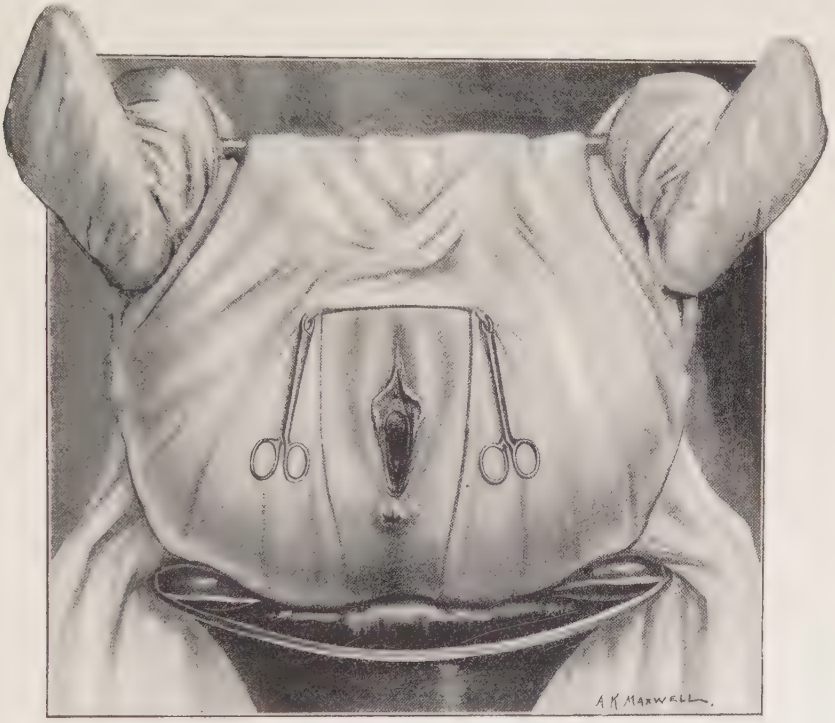


Fig. 324.—Patient in the lithotomy position ready for a vulval or vaginal operation.

OPERATIONS ON THE VULVA.

These are most commonly carried out for abscesses or cysts of Bartholin's duct and gland; for growths, lacerations, dyspareunia and for atresiae.

Excision of cysts of Bartholin's duct and gland. A vertical incision an inch and a half in length is made over the swelling on the inner margin of the labium majus; the whole cystic swelling with the expanded gland is then dissected out. Care must be taken not to 'button-hole' the vaginal mucous membrane in the process. Assistance may often be obtained in enucleating the deeper portion of the gland by inserting a protected finger (*i.e.* with a finger stall over the rubber glove) into the rectum, and pushing the gland forwards. There may be considerable haemorrhage from small arteries and veins, which must

be controlled with ligatures. In closing the wound it is important to place some buried catgut sutures to approximate the deeper parts, and a subcutaneous catgut stitch should always be employed, as in all vulval operations, to close the skin incision, in order to lessen the chance of subsequent infection. Care must also be taken to prevent this happening by keeping the parts very clean and by frequent changing of the dressings. Not uncommonly the cyst has become infected, and the abscess which had formed may have burst. In these circumstances the dissection is rendered difficult owing to the inflammatory infiltration all round the gland. It is advisable in these cases to drain with a gauze wick for a few days.

Excision of vulval growths.—If the growth be innocent in nature simple excision is sufficient. These tumours usually occur on the labia majora and can be entirely removed, if pedunculated, by means of an elliptical incision round the base. The wound is closed with a subcutaneous catgut suture. If the growth be a lipoma or other innocent tumour in the substance of the labium, an incision should be made

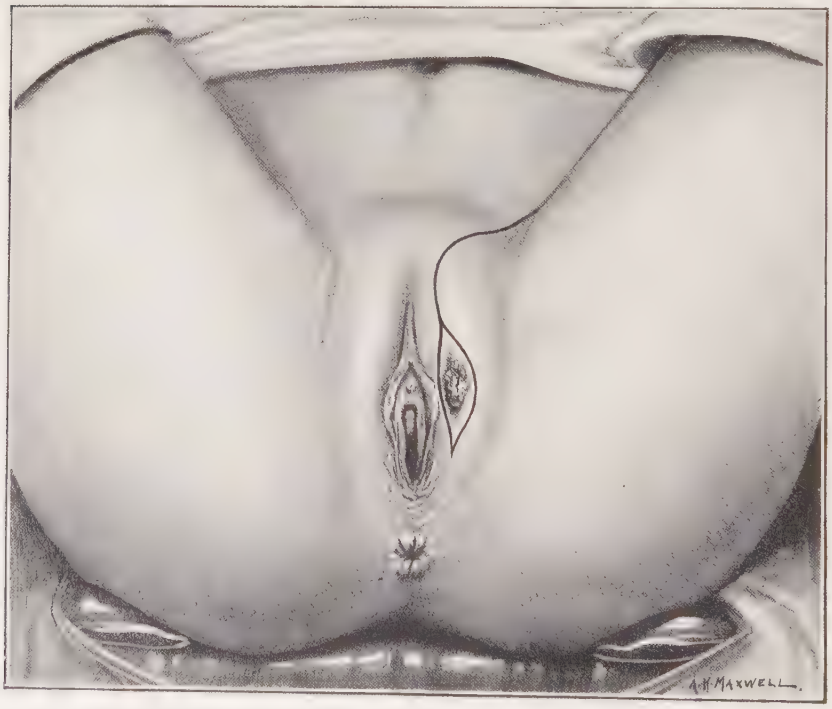


Fig. 325.—Incisions for the removal of a malignant growth on the left labium majus. The continuation upwards from the upper angle of the elliptical incision exposes the inguinal glands.

over the most prominent part, and the growth shelled out in the ordinary way.

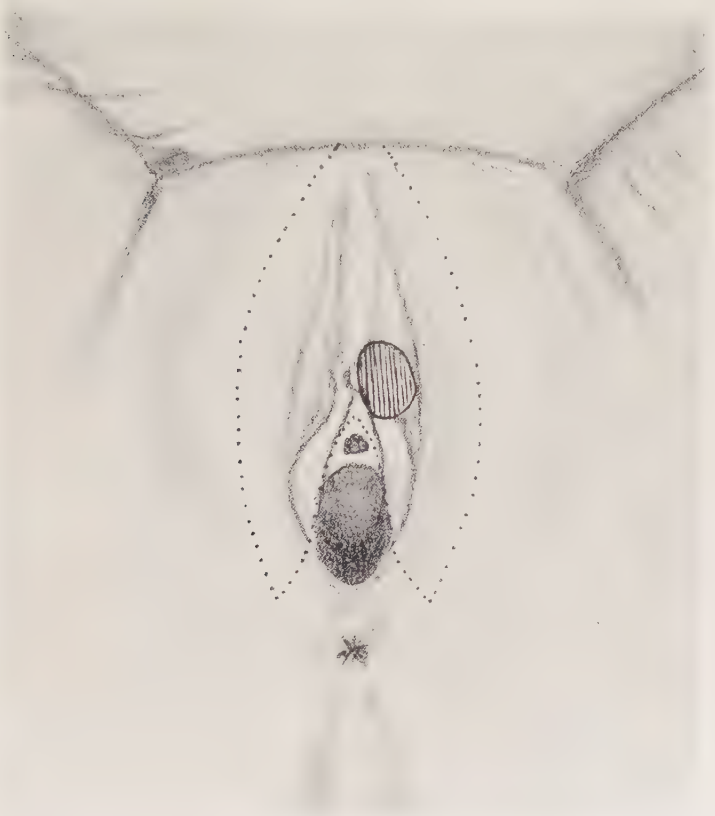


Fig. 326.—Incisions for the removal of a centrally placed malignant growth of the vulva. The incisions for the removal of the inguinal glands cannot be seen.

When the disease to be dealt with is malignant—carcinoma or sarcoma—a more extensive operation has to be undertaken, and as wide an area as possible removed with the growth. If it be outlying this involves an incision enclosing the tumour to be removed with all the underlying structures as deeply as possible and with a good wide skin margin. The upper angle of the incision is extended in a curved direction upwards and outwards over the inguinal canal. The growth is first freely excised at the sides, below and beneath, and then removed in one piece with all the fat and glands of the inguinal canal of that side (fig. 325). If the malignant growth be more centrally placed, as is often the case, and the clitoris or labia minora be involved, a more carefully planned operation is necessary. The

diseased area should be widely excised with a barbed arrow-head-shaped incision which, including the clitoris and labia minora, skirts the upper border of the urethra (fig. 326). The wound is closed by suturing together the sides of the 'barbs' separately, and the point of the 'arrow' from side to side. If the wound be a deep one (that is, in a fat subject) deep mattress sutures should be employed as well as superficial ones. From the point of the arrow incisions are continued upwards and outwards over *both* inguinal regions (not shown in the figure). The dissection, which reaches down to the aponeurosis of the compressor urethrae muscle, is carried out from below upwards, so that the growth, glands and fat are all removed in one piece.

Removal of urethral caruncles.—These little growths frequently demand radical treatment. The simplest way of effecting this, when the caruncle is pedunculated, is to run a mattress suture of catgut under the base; this is tied and the growth removed with scissors. The patient must be watched after the operation lest retention of urine occur, in which case a catheter must be passed every eight hours.

If the caruncle be of large size and surround the meatus the whole of the distal portion of the urethra must be dissected out and removed, the cut edges being sutured to the surface of the vestibule. Caruncles should never be cauterized; such treatment is very frequently followed by the formation of granulomatous 'recurrences.'

OPERATIONS ON THE VAGINA.

These are either of a plastic nature or are performed for the removal of growths.

Perineorrhaphy is performed for the repair of a relaxed outlet, for simple laceration of the perineum, or for complete laceration through the perineum into the rectum.

The simplest method of performing perineorrhaphy when there is no laceration of the sphincter ani is, perhaps, that known as the 'flap method.' This is carried out as follows.

The left side of the vaginal orifice is fixed and stretched outwards by the assistant. The operator fixes the right side in a similar manner with his left hand, and with a pair of angular sharp pointed scissors makes a semicircular incision round the lower part of the vaginal orifice at the junction of the mucous and skin surfaces (fig. 327).

The operator next covers the middle finger of his left hand, which is gloved, with a rubber finger-stall. This finger so protected is passed into the rectum, and under its guidance the flap marked out is stripped up from the rectum, and the levatores ani with their fasciae exposed on each side.

Any bleeding points are secured with artery forceps and tied with fine catgut, with the aid of the assistant.

Next, the operator passes three or four sutures of No. 3 chromicized gut from above downwards through the levatores ani on each side, keeping the finger in the rectum to prevent the bowel being

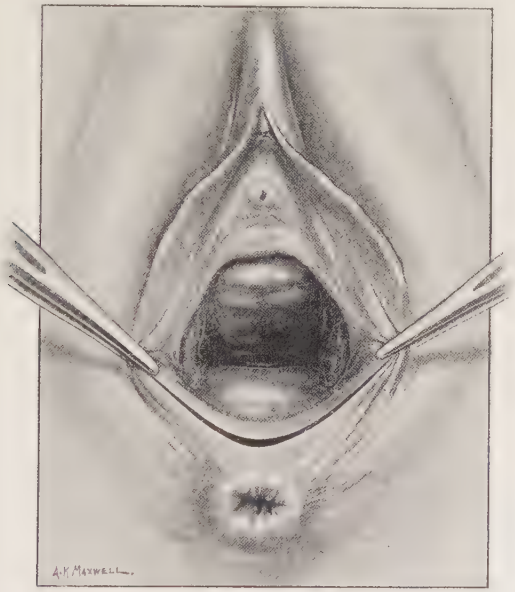


Fig. 327.—Incision for the 'flap method' of performing perineorrhaphy.

pierced. When these sutures have been placed (fig. 328) the finger is withdrawn from the rectum and the finger stall removed with a dab, the whole gloved hand being thoroughly washed in biniodide of mercury lotion or the glove changed, for it is, of course, of the greatest importance that the wound should not be infected.

The next step is to tie the sutures just placed. When this has been done the superficial parts of the wound are drawn together with a few interrupted catgut sutures, which do not emerge on the surface, and the skin is brought together with a continuous subcutaneous suture (fig. 329). The parts are now dusted with xeroform powder, and a dressing, which is kept in place with a T-shaped bandage, is applied.

If there be complete laceration into the rectum a more complicated procedure is necessary. Instead of the simple U-shaped incision the lower vertical arms are extended downwards (*i.e.* backwards) to the mid-axial line of the sphincter ani, or even further in bad cases (fig. 330). The incision thus becomes H-shaped, instead of U-shaped.

The vaginal mucous membrane is dissected up from the rectum as

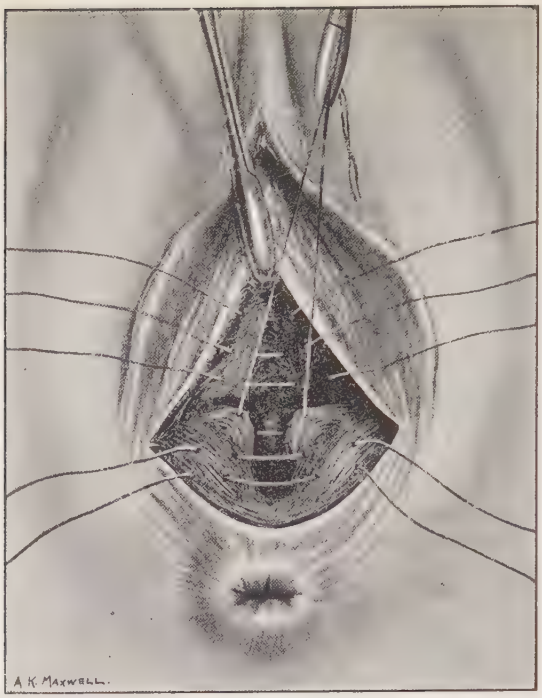


Fig. 328.—'Flap method' of performing perineorrhaphy. The first set of sutures have been placed through the levatores ani on each side and in the flap of raised vaginal mucous membrane.

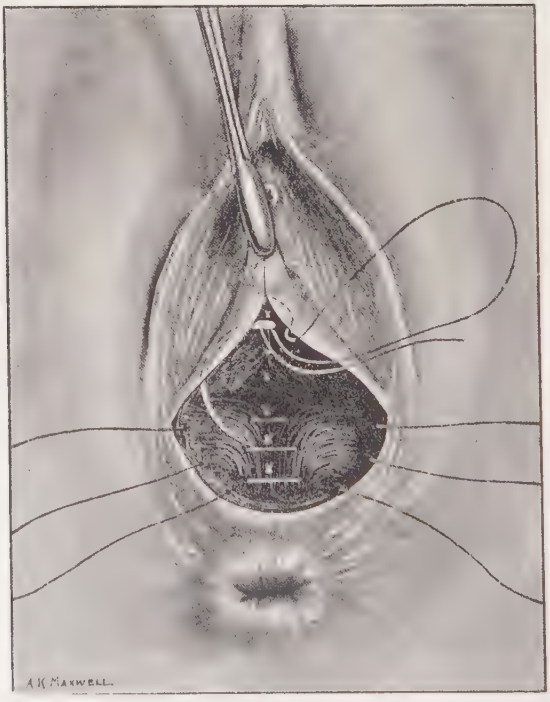


Fig. 329.—'Flap method' of performing perineorrhaphy. The deep sutures in the levatores ani and in the flap have been tied. The more superficial set through the levatores ani emerge just under the cut edge of the skin. The whole wound is finally closed with the subcutaneous suture shown.

described in the previous operation. The lower lateral arms of the original incision are then deepened so as to extend down on each side of the exposed rectum, in which a Λ-shaped deficiency of the anterior wall of the sphincter is now clearly seen. On each side of the sphincter a dimple will have been noticed before the lateral incisions were made. At these points are the retracted ends of the torn sphincter ani muscle; they should be found and secured with Kocher's forceps.

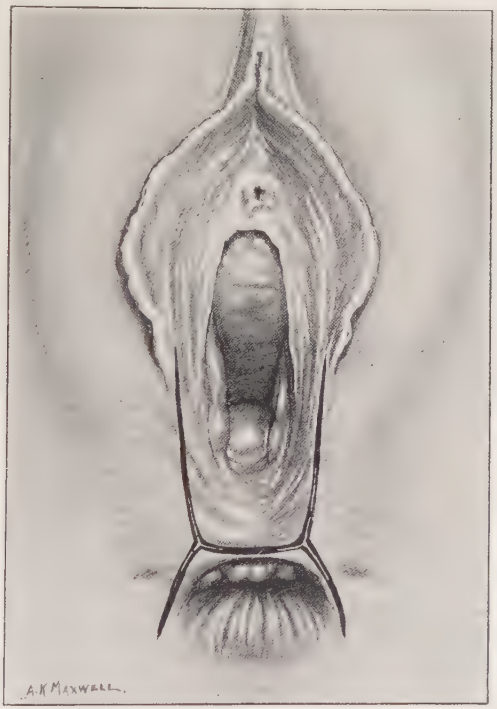


Fig. 330.—Incisions for perineorrhaphy when the tear is complete (*i.e.* into the rectum). The dimples on each side of the lower arms of the incision are caused by the retraction of the torn sphincter ani.

The rectum is now repaired. Commencing at the upper angle the Λ-shaped deficiency is closed with a turning-in stitch (fig. 331). The ends of the sphincter ani are next sutured together across the middle line.

The lower limbs of the H-shaped incision are united together across the middle line, after the upper perineal repair has been carried out as previously described. The result of this operation is shown in figure 332, which may be compared with figure 114, page 135.

Other methods of performing perineorrhaphy for lacerations of the perineum, or for a relaxed vaginal outlet, may be employed if there be no laceration into the rectum. It will not be necessary to describe

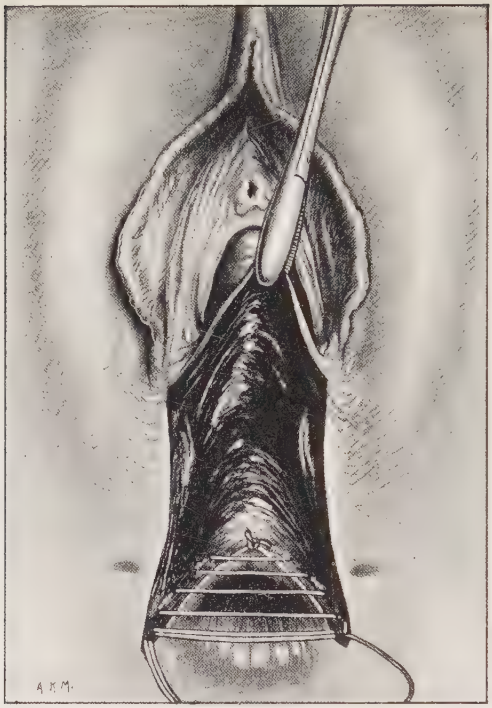


Fig. 331.—Denudation completed, and the suture inserted to close the torn lower end of the rectum, in the operation for complete laceration of the perineum.

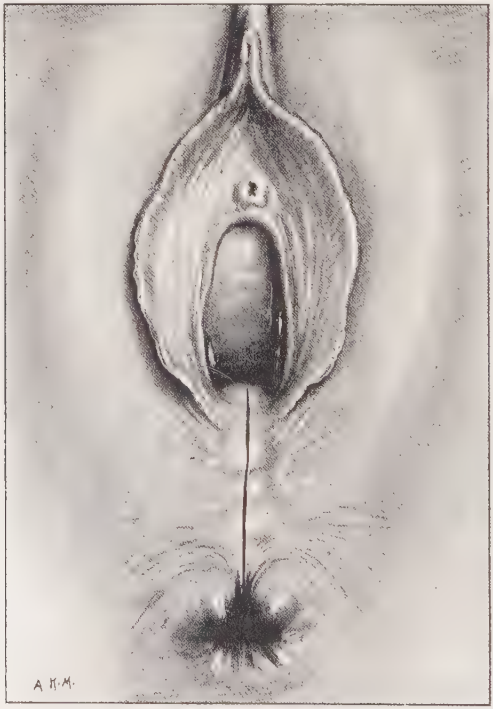


Fig. 332.—The operation for complete laceration of the perineum finished.

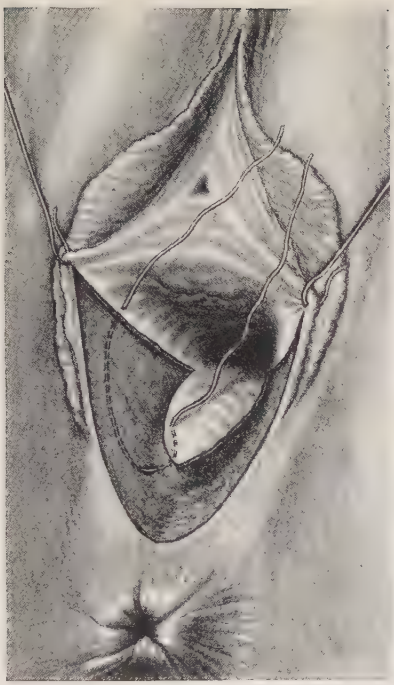


Fig. 333.

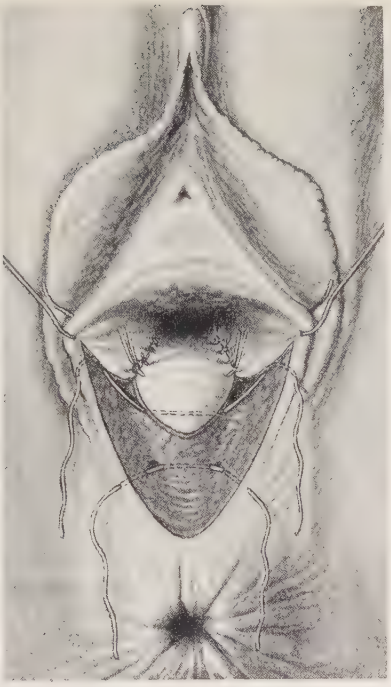


Fig. 334.

Fig. 333.—Kelly's method of perineorrhaphy for relaxed vaginal outlet. The tension suture is placed in the triangle on the right side. The dotted lines represent the part of the suture which lies concealed under the surface. The short piece of the suture visible as a white line at the bottom of the denudation is the part which is exposed by bringing the needle out at the bottom of the wound and reentering it close by.

Fig. 334.—Kelly's method of perineorrhaphy for relaxed vaginal outlet. The inside sutures are introduced and tied in both sulci. The gathering suture of chromic gut is introduced above across the angles, but is not tied. An auxiliary suture introduced to close the wound below this is also left untied.

Fig. 335.—Kelly's method of perineorrhaphy for relaxed vaginal outlet. Operation completed.

(Figs. 333, 334 and 335 are from Kelly's 'Operative Gynaecology,' by permission of the author, and publishers, Messrs. Appleton & Co.)

them in detail: they aim at denuding the vaginal mucous membrane and uniting the levatores ani across the middle line. The denudation of the mucous membrane is rightly held by some to be a disadvantage in the child-bearing period.

These methods are illustrated in figures 333, 334 and 335 (Kelly's method); and figures 336, 337 and 338 (Holden's method).

Holden's method is particularly simple and useful if there be a large rectocele with complete prolapse. In this operation the upper

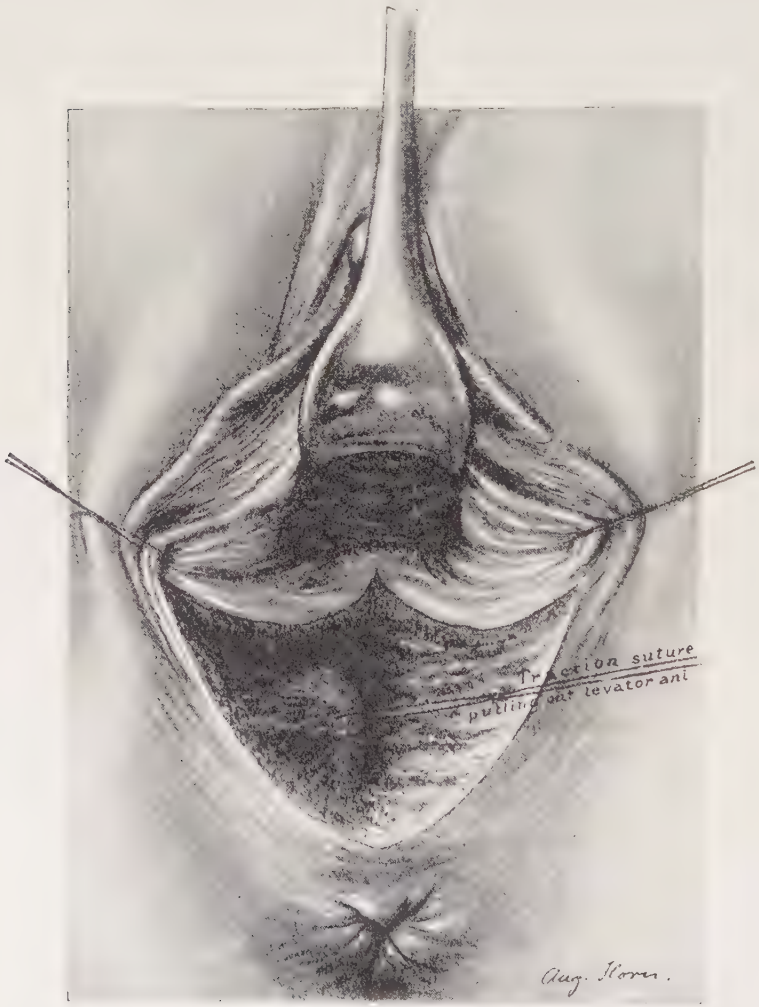


Fig. 336.—Holden's method of performing perineorrhaphy. Denudation completed. The temporary silk suture has been passed through the levator ani on the left, and traction on the suture makes the muscle stand out. (*From Kelly's 'Operative Gynaecology,' by permission of the author, and publishers, Messrs. Appleton & Co.*)

angle of the vaginal wound should extend at least half way up the vagina.

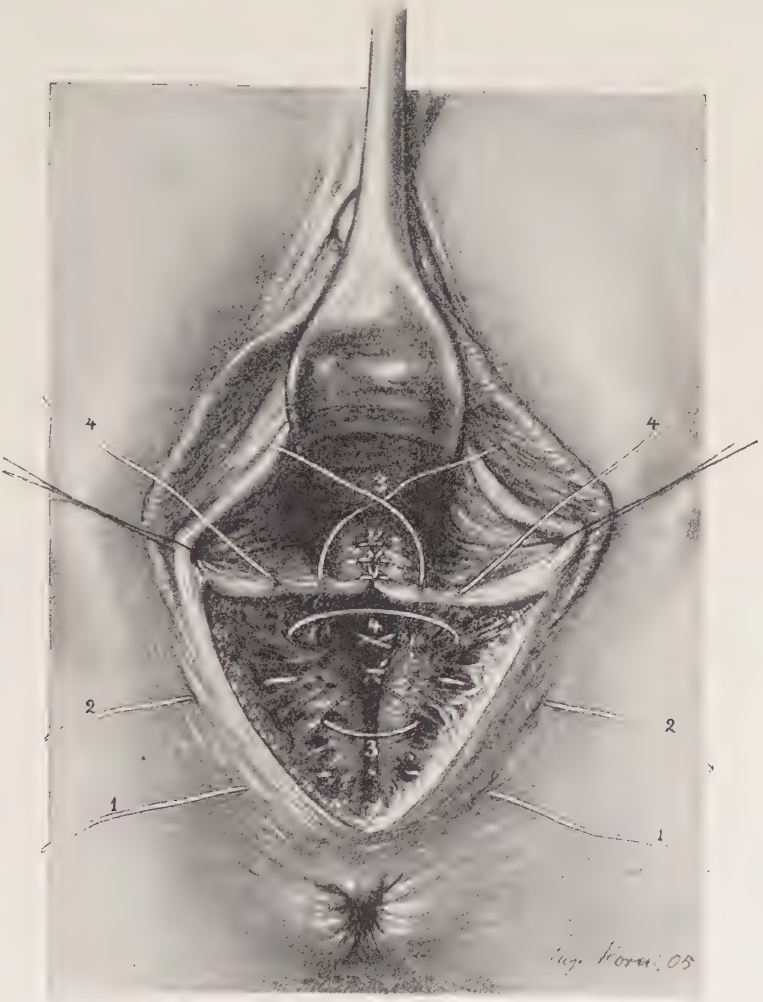


Fig. 337.—Holden's method of performing perineorrhaphy. Three internal stitches, approximating the mucosa, have been placed and tied. The two chromic catgut figure-of-eight sutures (3 and 4) have been placed and are ready to tie. They pass through mucosa and muscle. The temporary traction sutures through the muscles are no longer necessary and have been removed. Avoid dead spaces. (*From Kelly's 'Operative Gynaecology,' by permission of the author, and publishers, Messrs. Appleton & Co.*)

Colporrhaphy.—This operation is carried out to remove the stretched and redundant vaginal mucous membrane covering a cystocele or a rectocele. If it be the denudation of mucous membrane over

a cystocele that is practised, the operation is called anterior colporrhaphy; and in the case of a rectocele, posterior colporrhaphy.

These operations, together with perineorrhaphy, are frequently performed in conjunction with, or previous to, abdominal operations for prolapse.

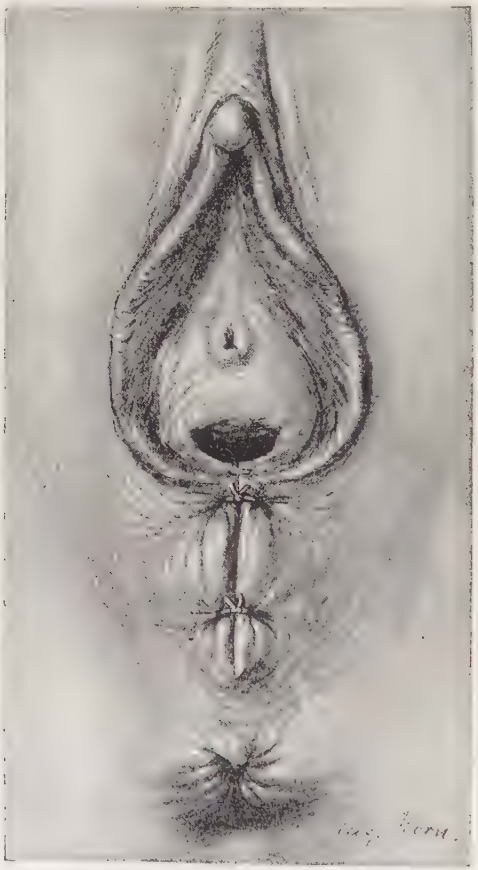


Fig. 338.—Holden's method of performing perineorrhaphy. Sutures tied and the operation completed. A superficial catgut stitch has been placed above the upper deep suture to approximate the skin. The labia are drawn aside to show the size of the outlet left. (*From Kelly's 'Operative Gynaecology,' by permission of the author, and publishers, Messrs. Appleton & Co.*)

Anterior colporrhaphy.—The perineum is first retracted with a short-bladed retractor. The cervix uteri is then seized with a volsellum and drawn low down, another volsellum may, if required, be fixed below the urethral orifice about one inch inside the vagina. Between these two points an oval area is marked out. The breadth of this

varies according to the size of the cystocele; usually it is about one and a half inches at the widest part. The vaginal mucous membrane must be completely cut through by the incision which marks out the area to be removed; if this be effected a plane is reached which allows the mucous membrane to be stripped off the underlying bladder by merely pulling on the upper freed angle of the piece marked out for removal (fig. 339). Any bleeding points on the bladder are caught with artery forceps and ligated with fine catgut.

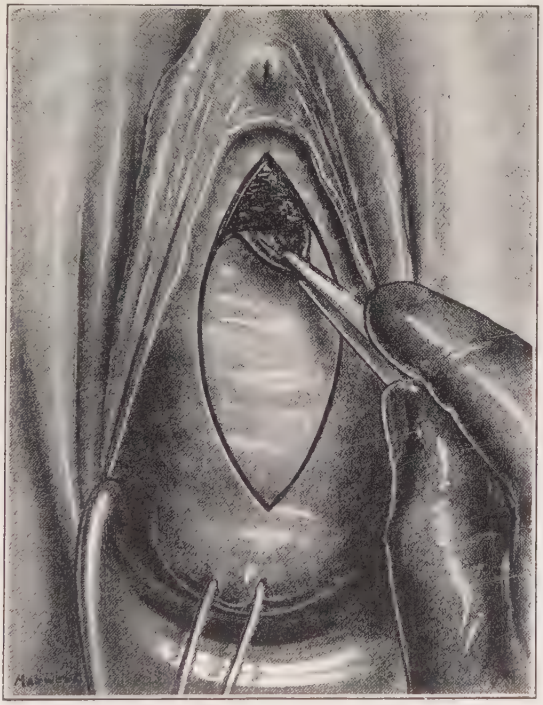


Fig. 339.—Anterior colporrhaphy. The area of denudation has been marked out and part of the vaginal mucosa stripped off.

The next step is an important one. The bladder is carefully separated all round the edges of the excised mucous membrane as far back as possible. Starting at the upper (cervical) end of the bare area, four or five narrow mattress stitches of No. 3 chromicized gut are placed and tied as far back from the edges of the incision as will allow of the raw under surfaces of the vaginal mucous membrane meeting. This leaves a raised ridge of widely approximated vaginal mucosa (fig. 340) whose edges may be sutured by a continuous stitch, nearer the edge than the sutures previously inserted; this, however, is not always

necessary. The above operation if properly carried out gives security against recurrence in ordinary circumstances.

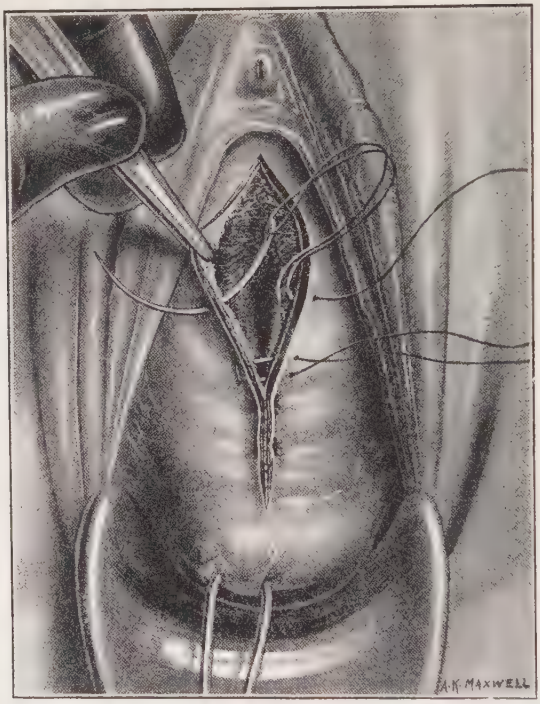


Fig. 340.—Anterior colporrhaphy. The closure of the bare area after removal of some of the vaginal mucosa. The edges have been dissected up and are united on their under surfaces with mattress sutures of chromic catgut.

Posterior colporrhaphy is carried out on similar lines, the rectum being laid bare instead of the bladder as just described. This operation is rarely done without repair of the perineum being carried out at the same time, in which case an extended Holden's operation, mentioned above, is the best combination.

In closing the wound deep sutures must be employed in the lower half in order to unite the levatores ani muscles across the front of the rectum. In the upper part of the vaginal wound the cut vaginal mucous membrane should be united with mattress stitches—as described for anterior colporrhaphy—bringing raw under surface to raw under surface.

Repair of fistulae.—**Vesico-vaginal fistulae.**—These are cured as a rule without much difficulty; but if a fistula be connected with the

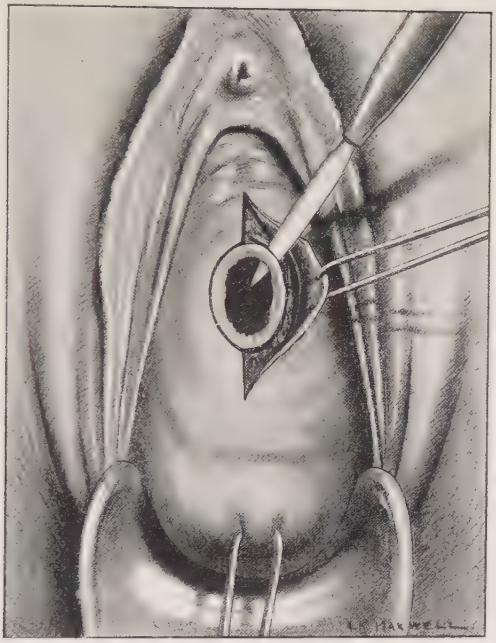


Fig. 341.—Repair of vesico-vaginal fistula. The line of incision is shown on the left side of the fistula (operator's point of view). On the right side the excision of the edge of the fistula and the separation of the vaginal mucosa from the bladder are shown.

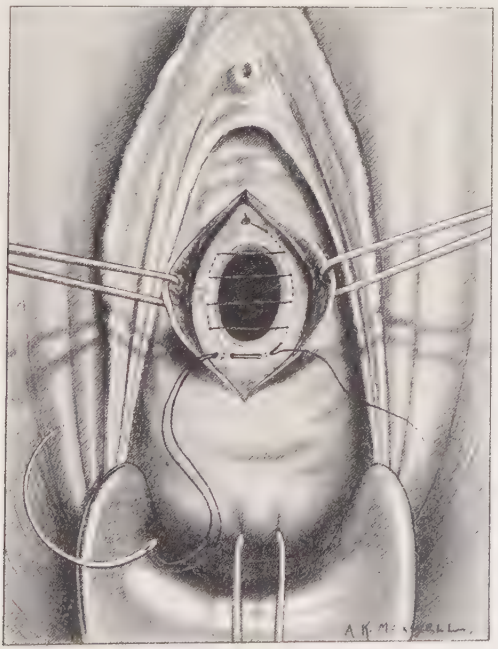


Fig. 342.—Repair of vesico-vaginal fistula. The closure of the hole in the bladder by a turning-in stitch is shown. The vaginal mucosa has been separated from the bladder all round.

ureter the matter often becomes one of considerable difficulty. Only the ordinary simple form will be described here.

After an incision has been made round the fistulous opening, and extending well beyond at each end in a straight line (fig. 341), the edges of the fistula are secured with fine tenaculum forceps. A narrow strip of the margin is then excised with a sharp tenotomy, or special fistula knife. Next the bladder is separated from the vaginal mucous membrane by thoroughly undermining the latter all round the fistula. The hole in the bladder is now closed with No. 1 chromicized gut stitches of the Lembert suture type (fig. 342).

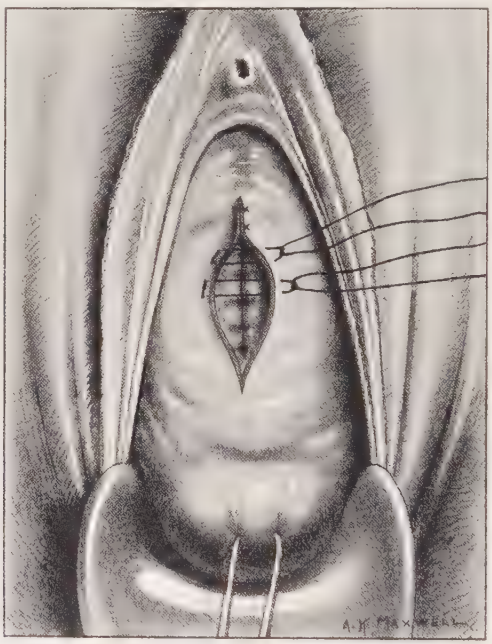


Fig. 343.—Repair of vesico-vaginal fistula. The bladder has been closed and the vaginal mucosa is being brought together with mattress sutures.

The continuity of the bladder is tested by passing a catheter and running into the bladder several ounces of sterile water made milky with a few drops of creolin. If there be a leakage the solution can be seen escaping. If there be no escape the vaginal mucous membrane is closed over the bladder sutures with mattress sutures of No. 3 chromicized gut, placed as directed for the colporrhaphy operations to bring raw under surface to raw under surface (fig. 343).

After this operation the catheter should be passed every six hours for the first three days.

Recto-vaginal fistulae.—These are dealt with in an exactly similar manner to that described above for vesico-vaginal fistulae, the rectum taking the place of the bladder. In many cases where the fistula is low down near the vaginal orifice it will be found advisable to perform Holden's perineorrhaphy (figs. 336, 337, 338); in which case after the rectum has been dissected free the hole is closed by turning in the edges in the way already described in reference to the bladder. The perineorrhaphy operation completes the procedure.

After an operation for recto-vaginal fistula the patient should be kept on a low diet, and the bowels kept confined for four days, when an aperient is given; this is followed the next morning by an olive oil enema (six ounces) to soften the faeces before they are passed.

Plastic operations for the formation of a new vagina are of a difficult and complicated nature, and each has to be planned according to the circumstances of the case, so that no description of these procedures can be given here.

Removal of vaginal cysts and growths.—Vaginal cysts may be dealt with in several ways.

Small traumatic inclusion cysts can be treated by merely snipping away the cyst round its base with scissors.

Large cysts, such as those of congenital origin, can be removed by excising the whole of the vaginal mucous membrane over the cyst together with the underlying cyst wall that bulges into the vagina. The edges of the cyst wall remaining are then sutured to the cut margins of the vaginal mucous membrane and the vagina packed with gauze (fig. 344).

The better treatment, however, is whenever possible to incise the vaginal mucous membrane and enucleate the cyst. But this is not always an easy matter, as the cyst may be of large dimensions and closely attached to the base of the bladder, and extend up into the broad ligament in intimate relationship with the ureter.

Removal of vaginal growths.—If innocent, such as fibromata, vaginal growths may be simply excised by making an incision round the base of the tumour, which is then shelled out, and the cut edges of the vaginal mucous membrane brought together and sutured with chromicized catgut.

When the growth is malignant the treatment is a formidable matter, and involves the *complete removal of the vagina* if the growth be situated low down; if high up, removal of the upper third together

with the uterus and appendages is necessary. This is best carried out by a combined abdominal and vaginal operation.

It may be thought that such an extensive operation is rarely possible or justifiable. It is only in the case of certain primary growths in the vagina that complete vaginectomy is practised. Extension

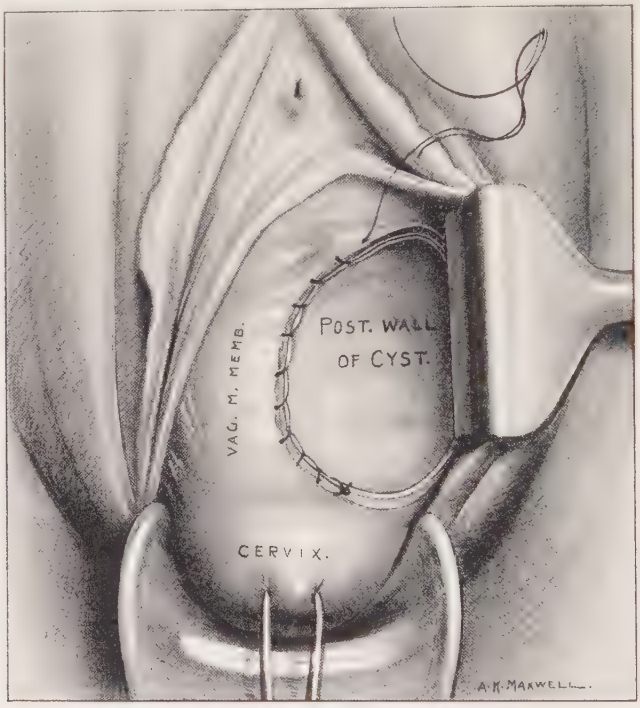


Fig. 344.—Removal of a large vaginal cyst of the Wolffian (Gartner's) duct. The portion protruding into the vagina is excised and the posterior wall of the cyst left. The cut edges of the cyst wall and vaginal mucous membrane are sutured together.

downwards to the vagina from a carcinomatous cervix is usually sufficient indication that the disease is beyond surgical aid; exceptional cases may, however, occasionally occur, in which removal of the vagina and uterus for extension of malignant disease from the cervix to the vagina is indicated.

The operation is not difficult, but the haemorrhage is often considerable, so that all vessels should be tied as soon as they are cut.

To remove the vagina a circular incision is made through the mucous membrane just inside the orifice. The vagina is then lightly packed with gauze, and, as soon as a short cuff has been dissected up all

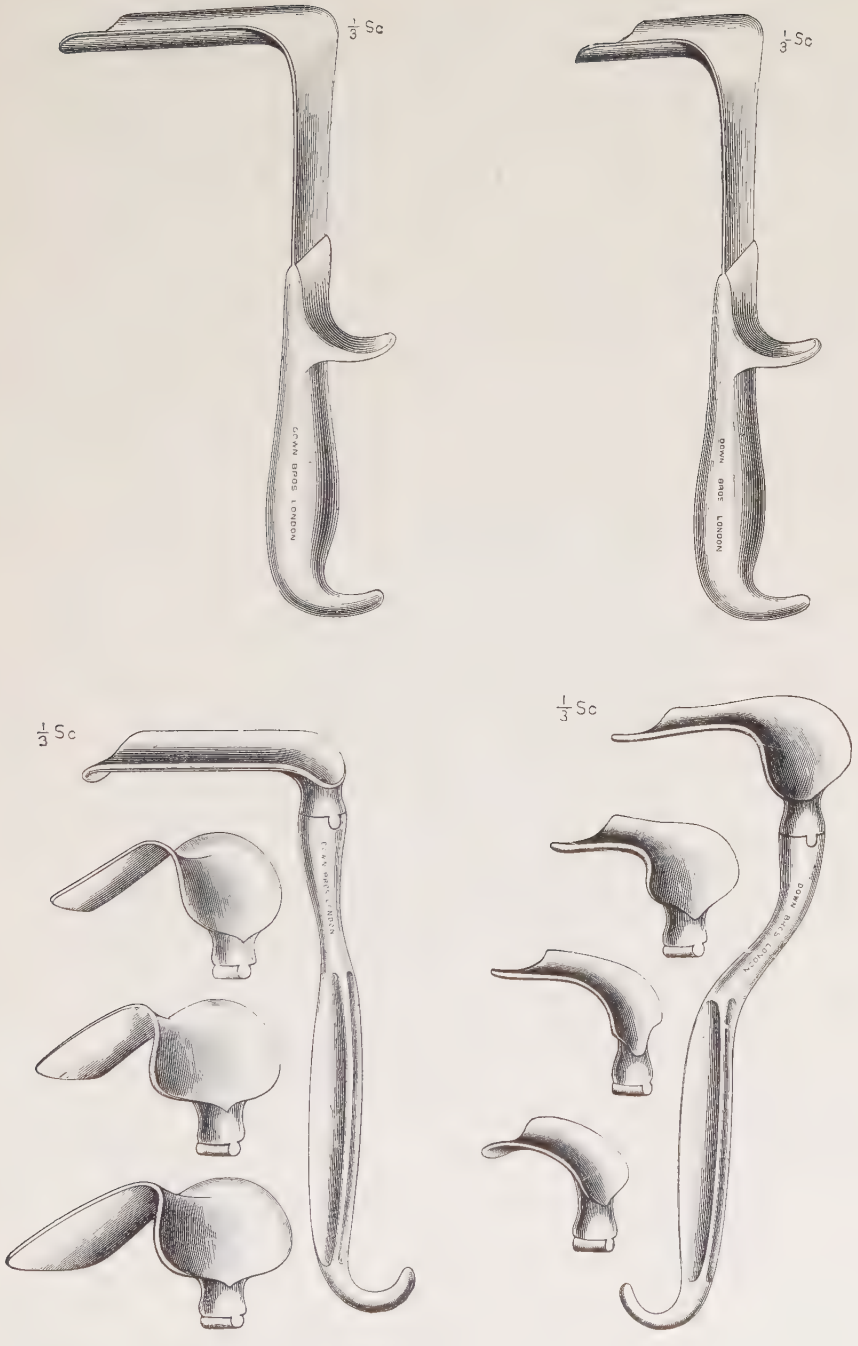


Fig. 345.—Various useful forms of vaginal retractors.

round, the vaginal canal is closed with a continuous suture. Dissection with the fingers, or by passing a closed pair of blunt-pointed scissors between the vagina and the bladder, or vagina and rectum, and withdrawing them opened out, is carried on until the vagina is entirely free. It is on the lateral walls that the greatest difficulty is experienced. Hysterectomy from below, or from above, completes the operation, the uterus and the vagina being removed in one piece.

VAGINAL OPERATIONS ON THE UTERUS.

In the following operations vaginal retractors will be constantly in use. The most useful varieties are shown in figure 345.

Trachelorrhaphy.—Repair of a lacerated cervix is a most satisfactory operation, but one which may require repetition after

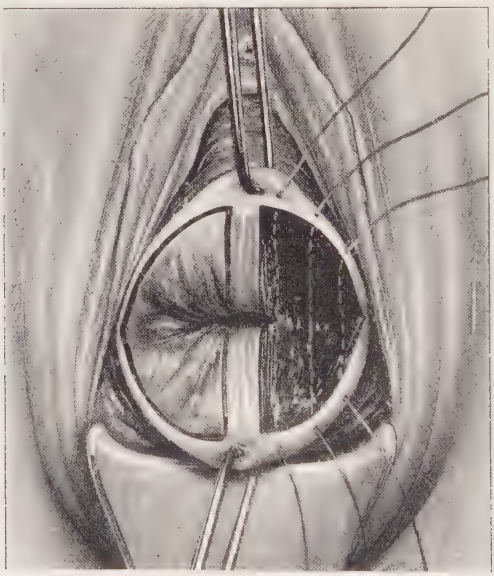


Fig. 346.—The operation of trachelorrhaphy. On the right side of the cervix, which is held open with volsella, are seen the incisions mapping out the everted area of the lacerated cervix to be denuded. On the left side of the cervix are seen the stitches which, when tied, bring together the bare surfaces.

subsequent labours. This operation should only be employed in single or bilateral lacerations; cervices with stellate lacerations should be amputated, if anything be done. To perform trachelorrhaphy the perineum is drawn back with a short-bladed retractor and

the cervix seized with two pairs of volsella—one applied to the anterior lip and one to the posterior—care being taken to secure a hold on the outer surfaces. The uterus is then drawn down. The lacerated area is denuded by marking it out with a superficial incision extending along the outer edge of one lip round the angle of the laceration and up the outer edge of the other lip. Another incision is made parallel to the canal of the cervix leaving a strip of cervical mucosa in the middle—the ends of these incisions are joined and the enclosed area superficially excised (fig. 346).

If the laceration be double the same procedure is carried out on the other side, with the same precaution in regard to the strip of cervical mucosa left to line the central canal. The raw surfaces are next approximated with No. 2 chromicized catgut, which is passed from the surface, under the denuded area of one lip of the cervix and out through the other lip in the reverse way—missing the central strip of endometrium (fig. 346). A small wick of gauze is passed into the cervical canal before the sutures are tied; this is withdrawn on the following day.

Operation for congenital stenosis of the cervix.—Mere slitting of the cervix as formerly practised is not sufficient; but the operation described by Pozzi gives excellent results. This is performed in the following manner.

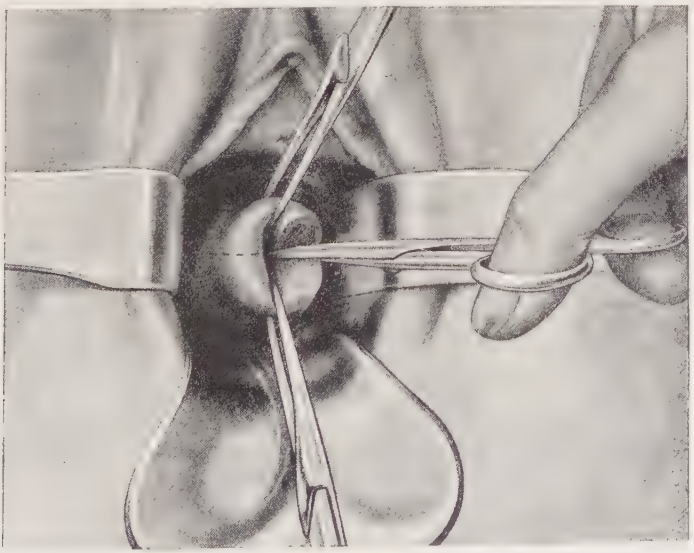


Fig. 347.—Operation for congenital stenosis of the cervix. First step: splitting the cervix laterally. (*Pozzi*, '*Journal of Surgery, Gynaecology and Obstetrics.*')

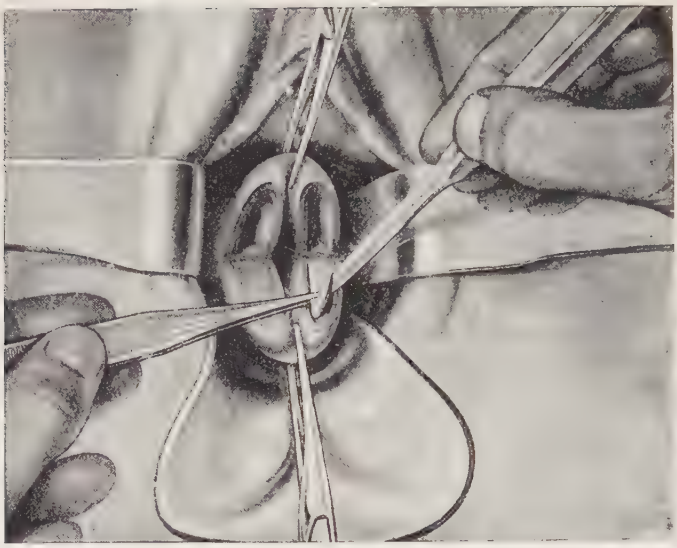


Fig. 348.—Operation for congenital stenosis of the cervix. Second step: excision of tissue from cervical flaps. (*Pozzi, 'Journal of Surgery, Gynaecology and Obstetrics.'*)

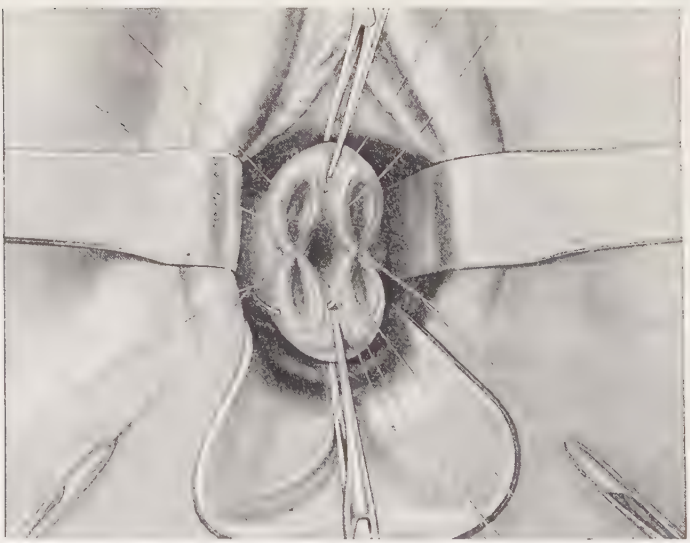


Fig. 349.—Operation for congenital stenosis of the cervix. Third step: suturing the vaginal surface of the cervix to the mucous membranes of the cervical canal. Wire sutures are shown in the above illustration, but chromic catgut is a better material to use. (*Pozzi, 'Journal of Surgery, Gynaecology and Obstetrics.'*)

The cervix is seized with volsella on the anterior and posterior lips. A bilateral division of the cervix is then made with scissors (fig. 347). The raw surfaces thus exposed are hollowed out (fig. 348) so that the mucous membrane of the cervical canal can be sutured on both sides to the vaginal surface of the cervix (fig. 349). A continuous chromic catgut suture is used on each side. In this way a wide external os is produced which does not become stenosed. Should there be a congenital hypertrophy of the cervix as well as the stenosis an amputation must be combined with the above operation.

Amputation of the vaginal cervix uteri.—This operation is never performed now for cancer of the cervix, for the removal of which operative procedures are confined to hysterectomy. Amputation

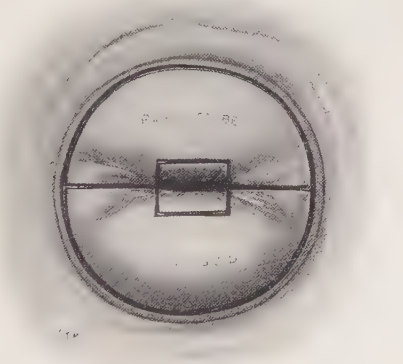


Fig. 350.—Amputation of the vaginal cervix showing the incisions down to the lateral angles and the circular incision round the cervix. The incisions for dissecting up the strips of cervical mucous membrane are also shown.

of the cervix is, however, indicated in cases of hypertrophy of the cervix, extensive stellate lacerations, and enlargement of the cervix associated with prolapse or due to the conditions known as cervicitis and endocervicitis.

The first step consists in grasping both the anterior and posterior lips of the cervix with volsella and drawing the uterus down. The lateral angles of the cervix are then incised down to the level of the reflexion of the vaginal mucous membrane. A circular incision is now made through the mucous membrane close to the cervix, and in some cases the bladder may be pushed up for a short distance in front.

A broad central strip of cervical mucosa is next dissected up from

each lip down to the lower level of the lateral incisions (fig. 350), and the rest of the lips included in the circular incisions amputated (fig. 351).

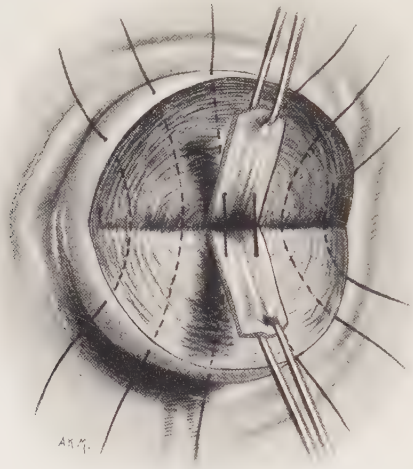


Fig. 351.—Amputation of the vaginal cervix showing the bare area left after removal of the cervix, and the strips of cervical mucosa dissected up. Some of the stitches have been inserted ready for tying.

A strong chromicized catgut stitch is now inserted on each side of the cervix. These pass through the vaginal mucous membrane, through

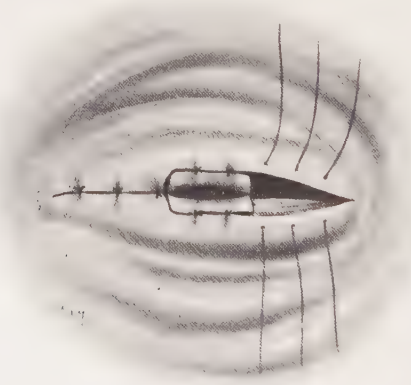


Fig. 352.—Amputation of the vaginal cervix. All but the last few stitches have been tied.

both cervical stumps and out through the mucous membrane again (fig. 351); when tied they close the lateral angles, and stop most of the bleeding.

A few more stitches fix the mucous membrane in front and behind to the stump and central strips of cervical mucosa which are then pared down flush with the vaginal vault (fig. 352).

Dilatation of the cervix uteri.—This may be carried out by rapid or slow processes. The rapid method is the one usually employed in connexion with operative procedures.

The cervix of the uterus dilates with difficulty or easily according to whether the patient be a nullipara or a multipara, and whether she be pregnant or not.

Dilatation of the cervix of the pregnant uterus belongs to the province of obstetrics; dilatation of the cervix of the non-pregnant uterus is a proceeding which is carried out in order to investigate the condition of the interior of the uterus, or to adopt treatment in regard to it.

To dilate the cervix the anterior and posterior lips are grasped with volsella on the outer surfaces, and the uterus is drawn down. A sound is first passed to learn the length and direction of the uterine cavity. It is important to ascertain these facts in order to guard against perforation of the uterine wall, which is not an uncommon accident. Probably no very serious consequences follow if the 'operation' be aseptically conducted, but lives have been sacrificed owing to this mishap, which is one not likely to conduce to the surgeon's peace of mind nor to the increase of his reputation. Great care and gentleness must always be employed and the operator must guard against that familiarity which breeds contempt. It is an accident that happens only to the very inexperienced and to the too experienced.

The length and direction of the cavity of the uterus having been correctly gauged, dilatation is carried out by means of graduated metal dilators (fig. 353). Commencing with the smallest size the cervix is

Fig. 353.—One of a series of graduated metal dilators for the cervix.

slowly dilated up to the required extent. In the case of a puerperal uterus where digital exploration is necessary the dilatation is carried up to the largest size. When curettement is to be performed dilatation

up to about half the range of sizes will be sufficient. There are various ways of numbering the dilators and various modifications of the instrument. It is important to have the points very blunt.

Curettement of the uterus.—This operation is carried out for the removal of an unhealthy endometrium, for small polypoid adenomatous growths, for the removal of the retained products of conception, and for diagnostic purposes.

When the condition is a puerperal one the operation is carried out with the finger or by gentle manipulation with the blunt flushing curette. This instrument has a hollow stem and can be attached to rubber tubing, which is connected with a reservoir containing sterile water. In this way the uterine cavity is continually flushed out while any fragments of placenta are being gently detached.

It is most important to remember that the walls of the puerperal uterus are very soft and easily perforated.

For the ordinary curettement of the uterus, when the operator endeavours to remove as much of the endometrium as possible, a sharp curette must be used. The best pattern is that shown in figure 354.

Fig. 354.—Auvard's sharp flushing curette.

This also has a hollow stem, so that a continual stream of water flushes out the uterus while the operation is in progress.

The operator takes the volsella attached to the cervix in his left hand, and holding the curette in his right passes it up to the fundus, keeping the cutting edge forwards. Commencing at one lateral angle he scrapes the anterior wall of the uterine cavity *firmly* down from the fundus to the cervix. He should feel and hear the curette grate on the muscle fibres underlying the endometrium.

Going across the whole of the anterior surface in this way the surgeon endeavours to space out each fresh attempt so that practically the whole of the endometrium is removed. This is never actually accomplished unless the uterus be first opened anteriorly in the manner to be described (see p. 502), but as a rule most of the endometrium can be removed by a skilled operator. The lateral and posterior walls of the cavity are next attended to in the same way, and finally the fundus is curetted by a transverse movement.

The operation is completed by the insertion of a sterilized gauze wick, which is removed twenty-four hours later.

Some operators apply chemicals of different kinds to the interior of the uterus, but this is of little use or value except in cases of uterine sepsis.

Removal of uterine polypi and cervical fibromyomata.—Cervical fibromyomata which present in the vagina are generally sessile and single. To remove them an incision is made round the base, and the tumour is shelled out if possible; if not, it is advisable to remove the cervix with the growth, for very often the cervical canal is blocked by, or stretched round, the base of the fibromyoma.

Uterine polypi may be very easily removed, or they may offer considerable difficulty. They are usually pedunculated, but the fibromyomatous variety is often sessile.

The ordinary adenomatous polyp and small pedunculated fibromyomatous polyp which present through the external os are best removed by dragging on the pedicle with a volsellum until the uterine attachment is exposed. The base of the pedicle is then cut through with a pair of scissors. No bleeding follows as a rule, but it is advisable to insert a gauze wick into the uterus for twenty-four hours. In the case of an adenomatous polyp it is wise after the growth has been removed to curette the uterus before packing with gauze, for there is usually an associated adenomatous condition of the endometrium. The larger fibromyomatous polyps which are expelled through the os may be strangulated. This leads to sloughing of the tumour. Great care must be taken in the removal of these, lest in dragging them down the uterus be inverted, or in cutting the growth away with scissors the uterine wall be cut through (see fig. 149, p. 190). The growth should always be removed piecemeal when it is sessile or the pedicle is very broad. If the growth be septic the uterus should be packed with iodoform gauze after the removal of the tumour.

When the polyp is still within the uterine cavity its removal may cause some difficulty. The cervix should be dilated and an attempt made to deliver the growth by dragging on it with a volsellum. If the tumour spring from the fundus and there is a great risk of inverting the uterus, one of the following methods must be adopted for the removal of it.

When the pedicle is slender the growth may be twisted off, or the pedicle cut through with the wire snare (fig. 355), otherwise hysterotomy should be performed, a good view obtained, and the pedicle cut through with scissors. This last method must always be employed when the polyp is sessile or has a broad base.

In deciding upon the treatment of fibromyomatous polyps, however,

one must remember that very often there are other growths in the uterine wall, and that hysterectomy may be the best procedure to adopt.

Fig. 355.—Wire snare for polypi.

Hysterotomy.—This operation is called 'hysterotomy' when performed on the non-pregnant uterus in the treatment of intrauterine diseases; and somewhat wrongly 'vaginal Caesarean section,' when performed for the removal of the foetus.

The technique is the same in either case. A transverse incision of the length required is made through the mucous membrane at the level of reflexion from the anterior lip of the cervix. The bladder is next carefully pushed away from the supravaginal cervix with the forefinger until the utero-vesical peritoneal pouch is reached. The uterine cavity is now opened by dividing the anterior wall in the middle line. If the middle line be strictly kept there is hardly any bleeding. The cut edges of the uterine wall are then seized with volsella and drawn down and apart. In this way the interior of the uterine cavity can be investigated, and polypi and other conditions properly dealt with. At the end of the operation the incision in the uterus is closed with catgut sutures, and the vaginal mucous membrane sutured in position.

Some surgeons always perform hysterotomy before curetting the uterus, but this is hardly necessary in ordinary circumstances.

VAGINAL HYSTERECTOMY.

This is an operation that has been widely practised in preference to abdominal hysterectomy by some surgeons, because it has been found to be followed by a lower immediate mortality. With the great improvements in the technique of abdominal hysterectomy it appears likely that for the treatment of malignant disease and fibromyomatous tumours (in the latter the mortality is practically nil) the abdominal route will displace the vaginal wherever it is now adopted, for the ultimate results and immediate possibilities are far better in the former.

Vaginal hysterectomy will, however, always be the proper operation in such conditions as postclimacteric haemorrhage without any definite malignant disease, and for early carcinoma of body or cervix in very old or extremely fat women.

Before describing the operation mention must be made of the **paravaginal incision of Schuchardt.**

This incision—two are sometimes employed, one on each side—is used in order to give the operator more room. An incision is made throughout the whole of the postero-lateral aspect of the vagina, and extending through the vaginal orifice, downwards and outwards, to the level of the anus. The incision runs, therefore, outside, and alongside of, the rectum (fig. 356). In this way a good deal of additional room

Fig. 356.—Schuchardt's paravaginal incision.

may be obtained in the vagina. After the operation is completed the paravaginal wound is closed with interrupted sutures of chromicized gut, which must include the whole depth of the wound. Outside the vagina a subcutaneous catgut suture is used to close the skin incision.

To perform vaginal hysterectomy comfortably two assistants are necessary. The uterus is first of all drawn well down with volsella, and several strong silk sutures are used to close the external os uteri, the ends being left long for the purpose of traction.

During the next step continuous irrigation greatly assists the operator by keeping the field of operation free from blood. The

vaginal mucous membrane is incised all round the cervix at the reflexion, and the bladder well pushed up in front. Great care must always be taken in separating the bladder from the supravaginal cervix in this and other operations, and only the finger or a piece of gauze should be used. From time to time the sound may be passed into the bladder to learn its relative position to the cervix. In pushing it away the tip of the palmar surface of the forefinger should be kept well against the anterior wall of the cervix. As a rule the bladder strips off the cervix easily; but when there is carcinoma of the cervix, even though the growth be not actually infiltrating the bladder, there is very often great difficulty in safely separating that organ from the cervix.

When the bladder has been well separated in front attention is directed to the posterior cul-de-sac, and the incision through the mucous membrane is deepened until the pouch of Douglas is reached. The peritoneum is recognized by the way it bulges into the wound. Irrigation is now stopped and the peritoneum seized with forceps and opened with a snip of the scissors. The aperture is widened with the forefingers tearing the pouch open laterally to the base of the broad ligaments.

A gauze pack is now pushed up into the pelvis to keep the intestines back. It is wise to have a string attached to hang out of the vagina, in order that the pack may not be forgotten or lost. The forefinger of the operator's left hand is next passed up the back of the uterus, and, if possible, made to reach over the fundus. The uterus is thus fixed while a pair of sharp-pointed scissors are inserted between the separated bladder and the anterior uterine wall, and pushed on, with the points kept close to the uterus and guarded by the finger over the fundus, until they penetrate the peritoneum at the vesico-uterine reflexion. When the points have perforated, the blades are opened and withdrawn in that position, thereby insuring a wide anterior aperture in the peritoneum.

The next step consists in tying off the broad ligaments on each side. Formerly the uterus was separated without ligation of the broad ligaments, forceps being left on for forty-eight hours. This can still be done in cases in which the operation has to be rapidly terminated; but in ordinary circumstances the method of securing the broad ligament by ligature is the better. To carry this out the uterus is retracted strongly to the patient's right side by the assistant, and the lateral incision into the mucous membrane on the left side of the uterus is deepened until cellular tissue is reached. The operator with his left forefinger behind the left broad ligament then proceeds to insert the ligatures (fig. 357). These should be of chromicized catgut

(No. 2) and should be passed about one-third of an inch from the uterus with a left aneurysm needle, or with an ordinary small round-bodied curved needle held in a needle holder, and should include tissue to the thickness of about one-third of an inch.

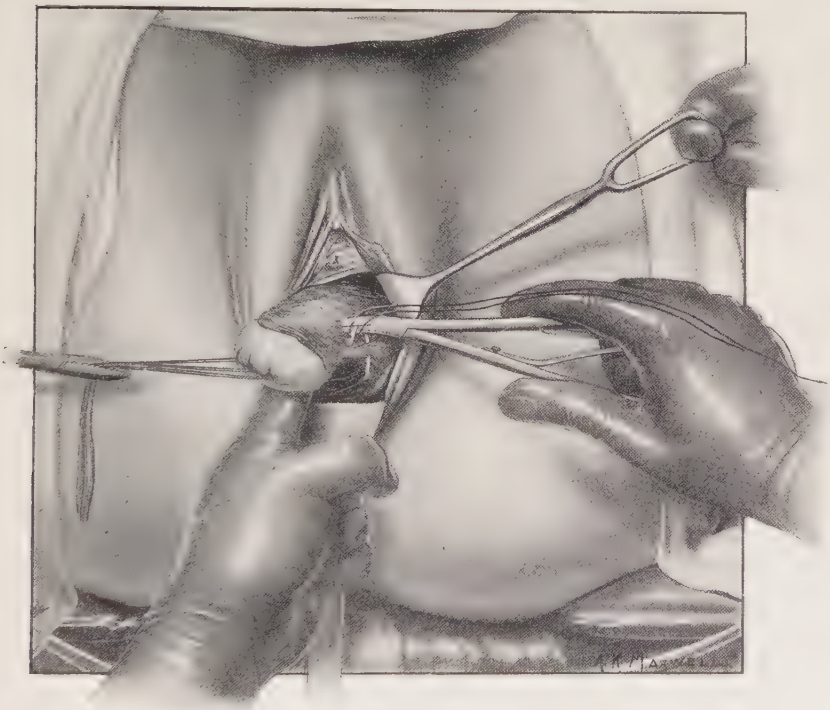


Fig. 357.—Vaginal hysterectomy. Insertion of sutures in the left broad ligament. Traction is being made to the right by means of the sutures used to close the external os. The supravaginal cervix has been separated from the bladder in front, and the pouch of Douglas and vesico-uterine pouch have been opened.

As soon as the ligature is securely tied the tissues embraced by it are cut through near the cervix in order to avoid injury to the ureters. The ends of the ligatures are left long, and are held gently aside by an assistant on the left of the patient: traction should not be put upon them, lest they be pulled off. As soon as the tissues cut through show signs of bleeding, it is time to place the next ligature, which is done in exactly the same way as before. Four to six ligatures in all are necessary on each side. The last embraces the Fallopian tube, and this should be tied well out so as to run no risk of the ligature slipping off. If there be cancer of the uterus it is advisable to remove the tubes and ovaries. This involves tying the

infundibulo-pelvic ligament—not always an easy matter by the vaginal route. In any case, whether the tubes and ovaries be removed or not, it is safer to have the top ligature of fairly stout silk. There is less liability for this material to slip.

It is not always possible to ligate one side of the broad ligament to the top before freeing the other side. In these circumstances, after three ligatures have been tied on the left side and the intervening tissue cut through, the uterus is drawn over to the left, and the lower part of the right broad ligament tied off and cut in exactly the same way as on the other side.

With the entire severance of one broad ligament the uterus can be delivered into the vagina (fig. 358), and the remaining portion of the broad ligament on the other side easily tied off and divided.

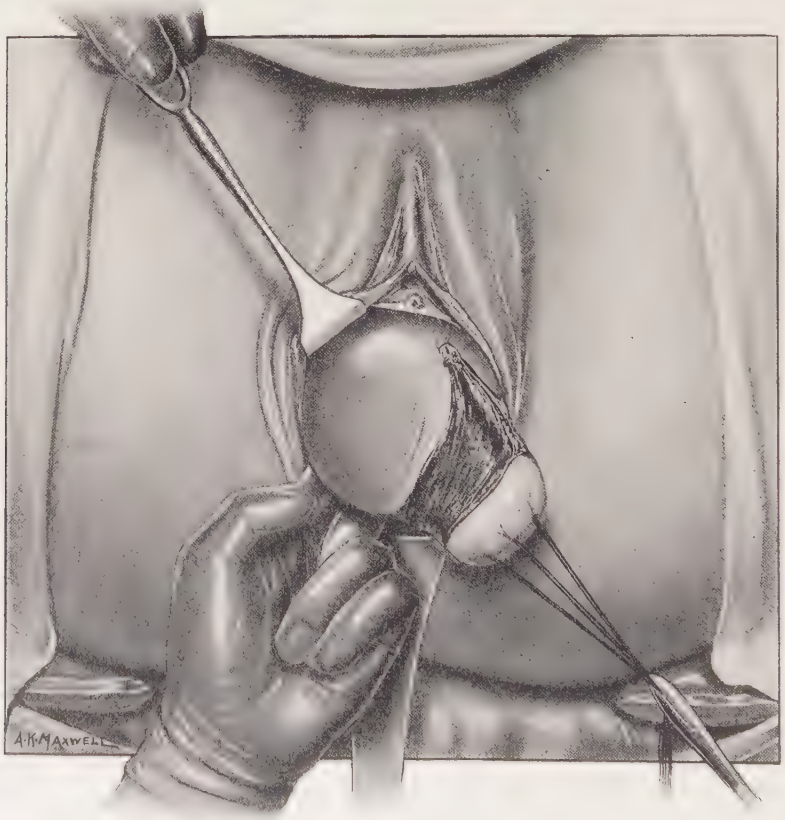


Fig. 358.—Vaginal hysterectomy. Delivery of the uterus. The whole of one broad ligament has been tied off and cut through, but the upper portion of the other remains to be done after the uterus has been turned out of the vagina.

The next steps are the withdrawal of the gauze pack from the pelvis, and the careful mopping out of any blood that may have escaped into the peritoneal cavity. The cut edges of the peritoneum before and behind are then united with a couple of stitches (fig. 359).

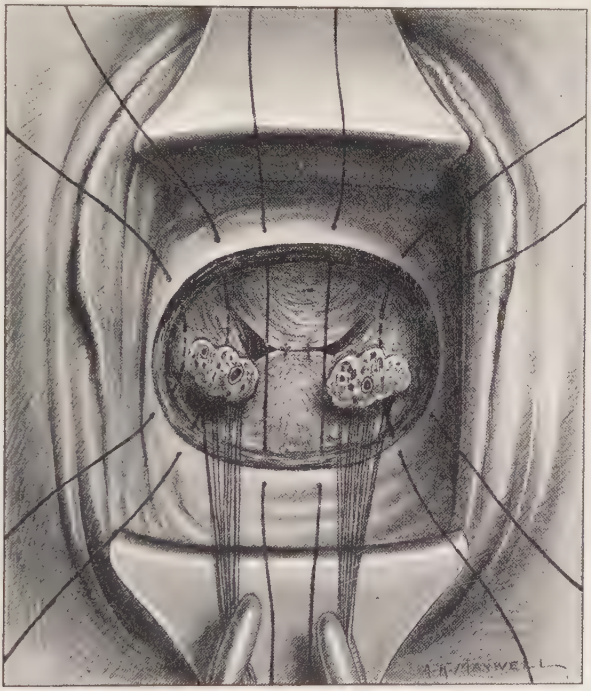


Fig. 359.—Vaginal hysterectomy. Closure of the vault of the vagina. The peritoneum is shown brought into apposition with two sutures. The stumps of the ligated broad ligaments are gently drawn into the vagina and fixed by the sutures as shown.

All the ends of the ligatures have been kept long and there is a collection on each side. Gentle traction on these brings the broad ligament stumps into view. The operator draws each stump—one at a time—into the lateral angle of the vaginal wound, and passes a sharp needle threaded with chromicized catgut through the mucous membrane near the edge of the anterior incision and about one-third of an inch from the lateral angle, on through the upper free edge of the stump and again through the mucous membrane of the posterior cul-de-sac (fig. 359). If the stump be drawn carefully down while the suture is tied it will be found that the surface of the broad ligament stump presents, and is fixed, in the vagina (fig. 360). As a rule it is better to put two such stitches through each stump. The bunch of ligatures is then cut fairly short.

This proceeding having been carried out on the other side, it will be found that the inside portion of the vaginal mucous membrane, forming the vaginal vault, falls together. An additional stitch or two is inserted to secure immediate union.

This method of closing the vaginal vault has the advantages of giving security should a ligature on the broad ligament slip, in which case the bleeding point would readily be formed, and of affording support to the vagina by the attachments to the broad ligaments.

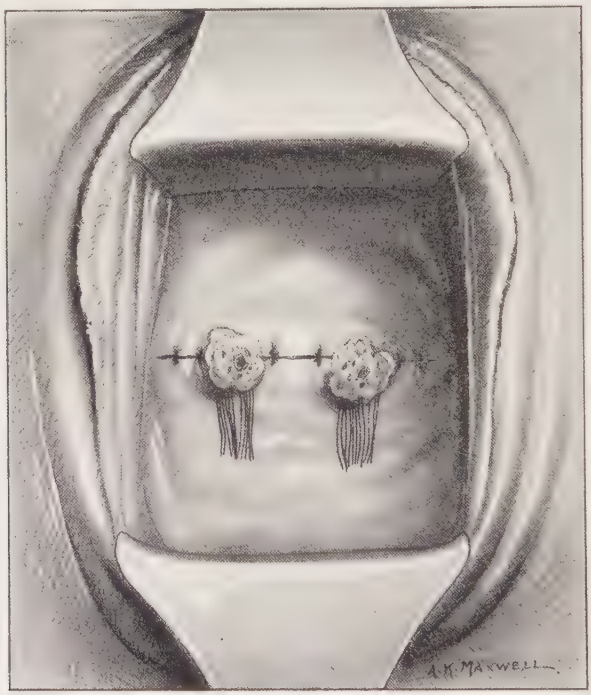


Fig. 360.—Vaginal hysterectomy. Closure of the vault of the vagina. The stitches shown in figure 359 have all been tied, and the stumps of the broad ligaments present in the vagina.

Before the subject of vaginal hysterectomy is dismissed it may be mentioned that if any injury be caused to the bladder it should immediately be repaired. As a rule it is advisable to use two layers of catgut in closing a hole in the bladder. Injury to the ureter has also happened not infrequently. This accident is usually followed by a uretero-vaginal fistula.

Further, the operator will sometimes find it impossible to remove the uterus with safety by the vagina. He should always be prepared, therefore, to finish the operation by the abdominal route.

POSTERIOR VAGINAL SECTION.

This method of access may be required for the removal of small tumours of the ovaries, or for opening abscesses in the pelvis.

Some operators remove gravid tubes and pyosalpinges, and attack many pathological conditions in the pelvis by vaginal section. Most surgeons, however, limit vaginal section in the treatment of pelvic disease to the removal of small ovarian tumours, and to the drainage of abscess cavities.

The operation is extremely simple. For the removal of a tumour a wide incision is made in the posterior vaginal fornix, and the peritoneum of Douglas' pouch opened. The tumour is reached and delivered with the fingers; the pedicle is tied with catgut and returned to the peritoneal cavity, and the peritoneum and vaginal mucous membrane sutured in two layers with catgut.

If there be an abscess to be drained the vaginal mucous membrane is incised, and a pair of dressing forceps is pushed through the incision into Douglas' pouch until pus is reached. The hole is then enlarged with the finger, and a rubber drainage tube passed into the abscess cavity and attached with one stitch to the vaginal mucous membrane. When all the pus present has escaped the vagina is mopped out and loosely packed with gauze.

* * *

Such are the essential principles of the chief operative procedures employed in gynaecological surgery at the present time. The student must remember, however, that only by watching and assisting at operations can a thorough knowledge be gained of the complications and difficulties that may, and frequently do, arise. He must, therefore, only utilize the brief descriptions given here as outlines to be filled in and rendered realistic and of practical value by the addition of the more detailed knowledge and experience he will gain in the operation theatre; just as in the study of the pathology, symptoms and non-operative treatment of gynaecological disorders, his reading must be supplemented by the use of the microscope and actual work in the out-patient room.

APPENDIX I.

ELECTROTHERAPEUTICS IN GYNAECOLOGY.

By

J. CURTIS WEBB, M.B., B.C. (Cantab.).

THE following electrical currents are used for therapeutic purposes in the treatment of gynaecological affections:

(1) Constant current.
(2) Faradic current.
(3) Static current

and X-rays.

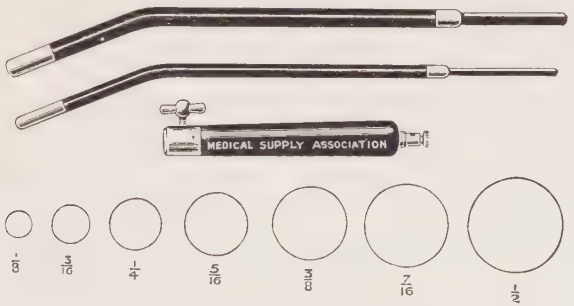
CONSTANT CURRENT.—This may be obtained either from a fixed battery of 40 to 50 Léclanché cells, each of a quart capacity, or from the ordinary portable battery of a similar number of cells. The disadvantage of the latter arrangement is that the cells being small quickly run down. The best method where possible is to use the current from the main, providing this be of the direct and not alternating variety. In either case it is of great importance that a suitable rheostat be employed to secure the gradual application of the current without any sudden increase or decrease. It is also necessary to have an accurate galvanometer, so that the strength of the current employed may be known.

To apply the current to the patient *external* and *internal electrodes* are required.

External electrodes consist of sheets of lead about seven inches by four in size fitted with a terminal to which the connecting cords are attached. These metal plates are separated from the patient's skin either by a layer of moist clay half an inch thick, or else by four to six layers of gamgee tissue well moistened in a solution of bicarbonate of soda. In the application of either type of protected electrode great care must be taken to

insure accurate apposition of the clay or gamgee tissue to the skin. The electrodes are placed either on the lower part of the abdomen or on the lower lumbar region; sometimes it is well to have electrodes connected to the 'indifferent' pole of the electric source in *both* these situations. This is especially the case when the 'active' electrode is intrauterine and the 'indifferent' electrodes, which are merely for the purpose of completing the circuit, are placed both on the abdomen and back, thus causing the current radiating from the internal to the external electrodes to affect both the anterior and posterior walls of the uterus.

Internal electrodes.—For intrauterine applications it is best to use metal rods, the terminal portions of which consist of zinc or copper cylinders of suitable and varying diameters. The extrauterine or vaginal portion must be well insulated, while the zinc or copper—if the internal electrode be positive—should be amalgamated with mercury (fig. 361).



Actual dimensions in which electrodes are made.

Fig. 361.—Webb's insulated sounds with metallic tips for intrauterine ionization.

For vaginal applications metal rods are also used. The one employed is insulated to within one inch of the end, which should be enclosed in a pledget of well-moistened absorbent cotton wool.

Actions of the constant current.—The actions of the constant current on living tissue may be considered under two headings:

(*a*) Chemical polar action, including ionization.

(*b*) Interpolar action.

The **polar action** is essentially a chemical one, and will vary according to whether the electrode be composed of bare metal or be separated from the tissue by a layer of clay or cotton wool. In the latter case the local chemical action (electrolysis) may be neglected.

When a current is passed through a bare metallic electrode in contact with living tissue there is a local effect which varies according to the polarity of the electrode. If it be positive the acid radicles of the saline solution by which the tissues are bathed migrate towards the positive pole, and free acid is formed in the neighbourhood of it. It is this free acid that produces the *cauterizing effect* around the positive pole when it is applied—for example,

inside the uterine cavity. If, however, the pole applied be negative, then the bases of the dissolved salts (which in the case of tissue fluids are those of sodium, potassium, magnesium, and calcium) are attracted to the electrode, and by union with hydroxyl radicles formed by the dissociation of water molecules give rise to alkaline compounds which have a *softening* or *solvent action* on the tissues around the negative pole.

These phenomena are really evidences of a form of ionic action, although they are not generally referred to as such. The term '**ionization**' is generally limited to the power possessed by electric currents of driving into the adjacent tissues particles of the material of which the electrode is composed or with which it is saturated. Thus it is found that when a positive electrode is composed of zinc or copper amalgamated with mercury particles of the mercury together with the zinc or copper penetrate into the tissue for a distance varying with the strength of current and the period of its application. The antiseptic properties of nascent zinc and mercury are well recognized, and advantage may be taken of this to combine with the cauterizing effect of the positive pole the sterilization of the surrounding tissue. It is, therefore, of importance when making use of the positive pole for internal application to select the metal of which the electrode is composed with due care. In the case, however, of the negative pole no such 'ionization' takes place, so that the metal of which it is composed is a matter of indifference.

There is further a phenomenon known as '*electrical osmosis*,' in which there is a tendency for the molecules of fluids between the poles to flow in the direction of the current—that is, from positive to negative; hence a congestive action in the region of the negative pole can be obtained.

Interpolar action.—Even when the seat of the disease is situated beyond the direct reach of the electrode, it is found that much can be accomplished "by means of the influence on nutrition of the chemic interchanges that occur throughout the circuit, in the onward progress of the electrons that appear finally at the poles; by the influence upon nutrition of the circulatory changes that result from vasomotor stimulation, and by the contractions that are produced in unstriated muscular tissue by heavy currents, even at a distance" (Massey).

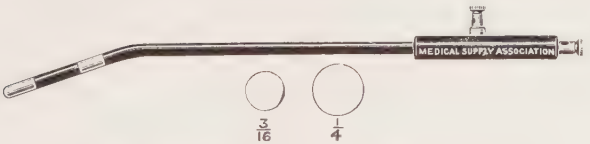
While it is impossible in such a brief résumé to enter into any details as to the exact technique of the application of the constant current to the various gynaecological disorders in which it has been found useful, it may be stated that the phenomenon either of electrolysis, ionization, or electric osmosis, together with the other interpolar actions may sometimes be separately or jointly employed to benefit such conditions as secondary amenorrhoea; certain cases of dysmenorrhoea and menorrhagia; subinvolution; inflammatory affections of the vagina, cervix, endometrium, and corpus uteri; non-suppurative inflammation of the ovaries and tubes and of the pelvic connective tissues; and certain pelvic neuralgias.

FARADIC CURRENT.—The action of this current depends on an alteration of the electrotonic state of the nerves coming under its influence. Provided the interruptions be sufficiently slow, muscular contraction and relaxation take place, so that the Faradic current can be utilized alone or in conjunction with the constant current in cases of subinvolution and in the very early stages of certain uterine displacements. If, on the other hand, the rate of the interruptions be extremely rapid—between four and seven thousand to the minute—no muscular contraction occurs, but a sedative effect is produced on the nerves in the vicinity of the electrode. Advantage can be taken of this sedative action of secondary currents from a long fine wire coil and interrupted at a high rate of frequency for the relief of pain in many pelvic disorders and pelvic neuralgias. In using Faradic currents it is necessary to arrange that the rate of interruption be capable of a wide range of variation; further, since muscular contraction is best obtained from the primary current the battery should be so constructed as to give an efficient and easily regulated output from the primary circuit.

The electrodes for the administration of the Faradic current may be similar to those described for the constant current; but when the effects of local sedation or muscular contraction are desired it is better to use bipolar vaginal or intrauterine electrodes (figs. 362 and 363).

Fig. 362.—Apostoli's bipolar vaginal electrode.

A.A'. Metal terminals to effect contact. *B.* Ivory stud used in the construction of the instrument. *C.C'.* Holes to receive plugs of connecting cords. *E.* Insulating material.



Actual dimensions in which electrodes are made.

Fig. 363.—Webb's bipolar intrauterine electrode.

STATIC CURRENT.—This current is one of an enormously high voltage, infinitesimal amperage and is unidirectional—that is to say, it differs from the high frequency currents in not being alternating. The unidirectional property can, by a suitable arrangement, be converted into a pulsating current, with a varying rapidity of pulsations, which in gynaecological practice finds its chief field of usefulness in the treatment of dysmenorrhoea and in sacralgia, which is a symptom commonly seen in patients who suffer from uterine troubles. Needless to say, if there be any gross lesion this must first be dealt with. It is usual to employ rectal applications of the 'Morton wave current' by means of a suitable electrode in cases of

dysmenorrhoea, whilst in sacralgia the application is made over the seat of pain, which is in the lower lumbar and sacral region, by means of electrodes composed of flat pieces of flexible metal about three inches square. In both cases the electrodes should be connected to the positive pole of the static machine, and the patient should be placed in a suitable position on the insulated platform during the application.

X-RAYS.—The X-rays may be used with advantage in certain chronic lesions of the vulva, such as leucoplakia, gonorrhoeal warts, tuberculosis, and recurrent malignant disease.

Researches have been carried out on the Continent and in America with the object of proving the value of the X-rays in the treatment of fibromyomatous tumours of the uterus. It is claimed that under the influence of the application of these rays, not only do the pain and haemorrhage cease, but that the tumours actually diminish in size. It is impossible to obtain any record of work done in this direction in the United Kingdom. On the Continent the pioneers of the X-ray treatment of fibromyomatous tumours are Albers Schonberg and Bordier. The mode of action is said to be manifold; in the first place, that X-rays cause atrophic changes in the ovaries whereby an artificial menopause may be induced; secondly, that they have a direct retarding action on the growth of the tumour. It is generally supposed that a fibromyoma originates from the uterine arterioles, from the adventitia of which embryonic cells multiply and form concentric layers of smooth muscle fibres. Advantage is taken of the fact that the X-rays act specially on embryonic cells, and any beneficial action following the application of these rays is attributed partly to this mode of action. Thirdly, that the rapidity of growth of a fibromyomatous tumour is to a certain extent in proportion to the circulatory activity of the uterus, hence whatever decreases the circulation of the organ may also decrease the fibromyomatous growth. Too small a dose will cause stimulation of the growth, a moderate dose inhibition, while an excessive dose brings about cell atrophy. It is obvious, therefore, that if good be obtained the dosage of the X-rays must be a factor of prime importance. Bordier employs a hard tube (9 to 10 Benoist), and screens the tube from the skin by sheets of aluminium from $\frac{1}{2}$ to $1\frac{1}{2}$ mm. in thickness. He continues the exposure until one of his pastilles placed on the skin underneath the filter has acquired the tint 0 on his scale. This observer states that with correct technique the effect of the X-rays on the ovaries and on the tumour can be secured without producing a dermatitis, and he claims that there is a great field of usefulness for this method of treating uterine fibromyomata. It is, however, hardly likely that this method of treatment will supplant the surgical procedures which have given such excellent results in recent years, except, perhaps, in those cases in which surgical interference is contraindicated owing to the presence of some other organic disease.

APPENDIX II.

CLASSIFICATION OF THE CAUSES OF CERTAIN SYMPTOMS.

§ i. HAEMORRHAGE FROM THE GENITAL ORGANS.

A. HAEMORRHAGES INDEPENDENT OF INTRAUTERINE PREGNANCY.

Menorrhagia and Metrostaxis.

- I. Local.
  - (*a*) Diseases of the ovaries, tubes or adjacent structures.
  - (*b*) Diseases of the uterus.
  - (*c*) Diseases of the vagina.
  - (*d*) Diseases of the vulva.
  - (*e*) Extragenital pelvic diseases.
- II. Constitutional and general. No gross lesion of genital organs.

B. HAEMORRHAGES RESULTING FROM PREGNANCY.

A. HAEMORRHAGES INDEPENDENT OF INTRAUTERINE PREGNANCY.

In this group, speaking generally, it will be found that in young unmarried women the cause is a constitutional one; and in married women, especially in middle life, a local one.

I. Local.

Diseases of the ovaries, tubes and **adjacent structures,**

(1) Enlargement, with hypersecretion of the ovary or ovaries (hyperoöphorism).

(2) **Oöphoritis, perioöphoritis** and **salpingitis.**

(3) Peri- and parametritis.

(4) Solid tumours of the ovary.
(5) **Small cysts of the ovary.**
(6) After oöphorectomy (? from irritation caused by the stump).
(7) **Ectopic pregnancy,** when terminating.
(8) Other tumours in the pelvis.

Diseases of the uterus.

(1) Adenoma. Erosion of cervix.
Diffuse or **polypoid adenoma of the endometrium.**
(2) **Fibromyomata** and **adenofibromyomata.**
(3) Cysts of the uterus.
(4) **Malignant diseases.** **Carcinoma.**
Sarcoma.
Chorionepithelioma.
(5) **Displacements.**
(6) Inversion by tumours.
(7) Simple ulceration of cervix (in prolapse).
(8) Trauma. Lacerations.
Foreign bodies.
(9) **Fibrosis uteri.**
(10) **Arteriosclerosis,** and **other menopausal changes.**

Diseases of the vagina.

(1) **Malignant disease.** **Carcinoma.**
Sarcoma.
Chorionepithelioma.
(2) Simple ulceration.
(3) Trauma. Lacerations.
Foreign bodies.

Diseases of the vulva (including the hymen).

(1) Malignant disease. Carcinoma.
Sarcoma.
(2) Simple ulceration.
(3) **Trauma.**
(4) Varicose veins.

Extragenital pelvic diseases. Tumours.
Infections.

II. Constitutional and general.

(1) Blood diseases. Purpura haemorrhagica.
Haemophilia.
Scurvy.
(2) Acute fevers.

(3) **Cardiac disease.** **Mitral stenosis.**
Mitral regurgitation.
(4) Venous congestion. Obstruction of inferior vena cava.
(5) **Disturbances of the nervous system.** **Fright** and **shock.**
Sexual excitement and **sexual excess.**
Insanity (active type.).
(6) Chronic debility.
(7) Bright's disease.
(8) **Hyperthyroidism.**
(9) **Hyperlactation.**
(10) Alcoholism.
(11) Hot climate.
(12) **Onset of menstruation** (? hyperthyroidism).
(13) **Menopause.**

B. HAEMORRHAGES RESULTING FROM INTRAUTERINE PREGNANCY.

(1) Menstruation in the early months.
(2) Association with innocent or malignant growths.
(3) Decidual endometritis.
(4) **Placenta praevia.**
(5) **Accidental haemorrhage** (detachment of placenta normally situated).
(6) Inversion.
(7) **Postpartum haemorrhage.**
(8) **Retained products of conception.**
(9) Hydatidiform mole.
(10) Trauma (rupture of uterus).
(11) **Subinvolution.**

§ ii. AMENORRHOEA.

A. CONGENITAL.

I. Local.

(1) Absence of ovaries.
(2) Absence of uterus.
(3) **Infantile type of uterus, tubes and ovaries.**
(4) **Atresiae of the genital tract.**

II. General.

(1) Disease of the pituitary and thyroid glands.
(2) General arrest of development (?dependent on ductless glands).

B. ACQUIRED.

I. Local.

(1) Atresiae of the genital tract.
(2) Removal of genital organs (oöphorectomy or hysterectomy).
(3) Superinvolution of the uterus.
(4) Deficient ovarian secretion (hypooöphorism).
(5) Extensive cystic or malignant disease of the ovaries.
(6) Extensive chronic inflammatory disease of the tubes and ovaries (rare).

II. Constitutional and general.

(1) **Anaemia, primary or secondary.**
(2) **Nervous disturbances.** Melancholia.
Shock and fright.
Postnuptial.
Pseudocyesis.
(3) Hypothyroidism.
(4) Pituitary disease and basal cerebral tumours (hypo-hypophysism).
(5) Exposure to cold.
(6) **Continued fevers.**
(7) **Chronic diseases** (*e.g.* phthisis).
(8) Climate.
(9) Drug habits.
(10) Unsuitable environment.

III. Physiological.

(1) **Pregnancy.**
(2) **Lactation.**
(3) **Menopause.**

§ iii. DYSMENORRHOEA.

A. DUE TO DISORDERED PHYSIOLOGICAL PROCESSES.

'Spasmodic dysmenorrhoea' (uterine colic).

(1) **Uterine clots due to uterine inertia.**
(2) Imperfect development of uterus.
(3) Exfoliation of the endometrium ('membranous dysmenorrhoea').

B. DYSMENORRHOEA CAUSED BY GROSS PATHOLOGICAL LESIONS.

(a) Diseases of the uterus.

(1) Growths of the uterus—especially submucous polypi.
(2) **Congestions of the uterus—especially associated with displacements, and overloading of the colon.**
(3) Foreign bodies in the uterus.

(b) Pelvic diseases.

(1) **Inflammatory disease of the appendages.**
(2) Tumours in the pelvis.

§ iv. PATHOLOGICAL DISCHARGES.

In regard to the following classification it is necessary to define the term 'leucorrhoea' as an excess of, or abnormal change in, the normal secretions. This term has become so engrafted upon gynaecology and the lay mind that it is impossible to dispense with it. The name itself simply means 'white discharge.' The term 'septic' implies the condition produced by any pyogenic organism.

A. FROM VULVA.

(a) Leucorrhoea.

(1) Seborrhoea of glands in labia majora and minora.
(2) **Vulvitis.** **Gonorrhoeal.**
Septic.
Irritative, from vaginal discharges.
Thread worms.

(b) Other discharges.

(1) **Infective ulcerations.** **Syphilitic.**
Tuberculous.
Gonorrhoeal.
Septic.
(2) Malignant ulcerations. Carcinomatous.
Sarcomatous.

B. FROM VAGINA.

(a) Leucorrhoea.

(1) **Infective vaginitis, acute or chronic.**
(2) **Foreign bodies (e.g. pessaries) in the vagina.**
(3) **Congestion due to pregnancy,** or to large tumours of the ovaries and uterus, and other pelvic tumours.

(b) **Other discharges.**

(1) Infective ulcerations. Syphilitic.
Tuberculous.
Septic.

(2) **Malignant ulceration.**

(3) **Faecal (with fistula).**

(4) **Urinary (with fistula).**

C. FROM UTERUS.

(a) **Leucorrhoea.**

(1) **Infective endocervicitis and endometritis.**

(2) **Adenomatous endometrium.**

(3) Fibromyomata uteri.

(4) Pressure on the uterus of ovarian and other pelvic tumours.

(5) **Congestion of cervix due to pregnancy.**

(6) **Congestion of venous circulation due to displacements of the uterus.**

(7) **Congestion of pelvic veins due to chronic constipation.**

(b) **Other discharges.**

(1) Infective ulcerations. Tubercle.

(2) **Malignant ulcerations.** **Carcinomatous.**
Sarcomatous.
Chorionepitheliomatous.

(3) Abnormal conditions of the products of conception.

(4) Urinary (with fistula).

(5) Foreign bodies (*e.g.* stem pessaries).

D. FROM FALLOPIAN TUBES.

(a) **Leucorrhoea.**

(1) **Slight infective salpingitis.**

(2) Adenoma of the mucous membrane.

(3) Congestion due to displacements.

(4) Congestion due to pressure of ovarian or other pelvic tumours.

(b) **Other discharges.**

(1) Infective ulcerations. Tuberculous.

(2) Malignant ulcerations. Carcinomatous or sarcomatous.

§ v. PRURITUS VULVAE.

I. LOCAL CAUSES.

(a) Extrinsic.

(1) Irritating discharges.

(*a*) Vaginal and uterine.
(*b*) Recto-vaginal and vesico-vaginal.
(*c*) Urethral (gonorrhoeal).
(*d*) From vulval ulcerations.

(2) Thread worms.
(3) Local medication.
(4) Dirt.

(b) Intrinsic.

(1) Vulvitis.
(2) Leucoplakia.
(3) Varicose veins.

II. GENERAL CAUSES.

(1) Diabetes.
(2) Constitutional irritating rashes, such as that of scarlet fever, eczema and urticaria.
(3) Gout.
(4) Neuroses.
(5) Sexual desire.

§ vi. DYSURIA.

I. LOCAL CAUSES.

(a) Diseases of the bladder and urethra.

(1) Growths.
(2) Primary infections.
(3) Foreign bodies (including stone).
(4) Strictures.

(b) Displacements of the uterus and vagina.

(1) Anteversion of uterus (with pregnancy).
(2) Retroversion of uterus (especially with pregnancy).
(3) Prolapse of uterus, with cystocele.

(c) **Diseases of the vagina and uterus.**

(1) **Extension of growths**
(2) **Extension of infections** } with or without fistula.
(3) Fistulae.

(d) **Diseases of the appendages.**

(1) Extension of infections.
(2) Extension of growths.

(e) **Pressure on the bladder by tumours.**

(1) **Uterine.**
(2) **Ovarian.**
(3) Other pelvic tumours, such as those arising from the kidney.

(f) **Traumatic.**

(1) **Parturition.**
(2) **Postoperative (especially hysterectomy).**
(3) Irritating lotions.

II. GENERAL CAUSES.

(1) Disease of the kidney.
(2) **Neuroses.**
(3) **Hypothyroidism.**
(4) **Postoperative.**

§ vii. STERILITY.

Sterility may be either *permanent* or *temporary*.

A. PERMANENT STERILITY.

I. Congenital.

(1) Absence of essential parts of the genital organs.
(2) **Infantilism of genital organs.**
(3) Abnormalities of essential parts of genital organs.
(*a*) Atresia.
(*b*) Mal-developments.

II. Acquired.

(1) **Extensive destructive disease of uterus, tubes, or ovaries.**
(2) Operative removal of uterus, tubes, or ovaries.
(3) Superinvolution.

B. TEMPORARY STERILITY.

I. Local.

(1) **Congenital conditions.**

(*a*) **Elongated and conical cervix.**

(*b*) Acute flexions.

(*c*) Atresia of the lower genital passages (if discovered early).

(2) **Acquired conditions.**

(*a*) Atresia.

(*b*) **Slight inflammatory disease of the uterus and Fallopian tubes.**

(*c*) Adenomatous endometrium.

(*d*) Vaginismus.

(*e*) Pathological discharges.

II. Constitutional and general causes.

(1) **Inherent selective causes in ova or spermatozoa.**

(2) General disturbances of metabolism.

(*a*) **Malnutrition.**

(*b*) Obesity (? hypothyroidism).

(*c*) Chlorosis.

(*d*) Myxoedema.

N.B.—The question of sterility on the part of the husband must, of course, always be taken into consideration.

INDEX.

Abdomen, areas of, 97.
auscultation of, 105.
drainage and packing of, 138, 141, 278, 410, 431, 432, **449**.
enlargements of, 101.
hyperaesthesia of, 101.
inspection of, 97.
mensuration of, 106, 340.
methods of examining, 96.
palpation of, 100.
percussion of, 104.
pigmentation of, **83**, 84, 99.
rigidity of, 95, 99, 101, 230, 248, 272, 430.
Abdominal distension, **427**, 431.
hysterectomy, 455. (*See also* 'Hysterectomy.')
incision, 450.
operations, 445.
ostium, 13, 231, 249. (*See also* 'Ostium abdominale.')
accessory, 118.
pregnancy, 229.
secondary, 229, 231, 236.
Abortifacients, 221.
Abortion, **220**, 231.
chorionepithelioma, followed by, 378, 380.
criminal, 137, 140, 222.
due to fibromyomata uteri, 317.
retroflexions, 153, 156, 165.
syphilis, 261.
incomplete, **224**, 236.
ovarian, 229.
threatened, 222.
treatment of, 223.
tubal, **231**, 385.
Abscess, appendiculo-tubal, 274.
of Bartholin's gland (*q.v.*).
extratubal, 274.
ovarian, 251, 253, 294.
pelvic, 151, 234, 236, 251, 268, 269, 509.
periappendiculo-tubal, 274.
uterine, 276.
Absence, of Fallopian tube, 120.
of genitalia as cause of sterility, 216.
Absence
of ovary, 117, 193.
uterus, 120, 123, 193.
vagina, 120, 123.
Acetone for carcinoma cervicis, 372, 374.
Acidosis, 417, 423, 432.
Actinomycosis, 281.
Acute disease, menorrhagia in, 200.
secondary amenorrhoea in, 198.
subinvolution in, 226.
Adenocarcinoma, of cervix, 367.
of body of uterus, 375.
Fallopian tube, 384.
ovary, 386, **387**.
uterus, 329.
vulva, 356.
Adenofibromyoma of cervix, 302.
of round ligament, 331.
uterus, 327.
vagina, 300.
Adenoma, of endometrium, **302**, 310.
with fibromyomata, 317.
sterility, 217, 317.
of Fallopian tube, 332.
malignum, 375.
of uterus, 199, **300**, 500, 501.
vulva, 298, **299**.
Adherent labia, 131.
Adhesions, peritoneal, 377, 432, 460, 463, 466, 470, 472.
subinvolution with, 227.
uterine, abortion due to, 222.
with ovarian tumours, 339, 350, 352.
Adrenal gland, 67.
disease of, 393.
inclusions in ovary, 352.
influence on menstruation, 77.
influence on uterine contractions, 87.
Adrenalin for shock, 426.
After-treatment of operation cases, 420, 421.
Age differences in uterus, 49.
Albert Smith pessary, 153. (*See also* 'Pessary.')
Alboline, 444.

Albuminuria, 311.
Albumin water, 420, 421.
Alcock's canal, 61.
Alcohol, avoidance of, in dysmenorrhoea, 209.
in gonorrhoea, 256.
menstrual disorders, 197.
Alcoholism, chronic, menorrhagia in, 201, 398.
Alexander-Adam's operation, 164, **465**.
Alimentary disturbances at menopause, 89, 212.
Alum injections for pseudo-ileus, 428.
Amenorrhoea, **193**, 517.
absent or rudimentary genitalia with, 120.
at climacteric, 91, 212.
forward displacements with, 149.
ovarian cystadenoma with, 158, 337.
pituitary (hypophysial) disease with, 393.
in pregnancy, 81, 82.
primary, 192, **193**.
general causes of, 194, 518.
local causes of, 193, 517.
psychoses with, 394.
secondary, 193, **195**.
constant current for, 512.
general causes of, 196, 518.
local causes of, 195, 518.
physiological causes of, 198, 518.
superinvolution with, 227.
in thyroid disease, 194, 198, 392.
tubal pregnancy, 232.
tuberculosis, 398.
Ampulla of Fallopian tube, 43, 229.
Amputation of cervix uteri, 120, 139, 257, **497**.
Anaemia, cause of secondary amenorrhoea, 196.
secondary, with fibromyoma uteri, 308, 327.
Anaesthesia, 417.
for examinations, 95, 101, 110, 116, 151.
Angioma, 298.
of vulva, 300.
Anteflexion of uterus, 149.
examination in, 112.
fibrosis uteri with, 265.
hysterotomy for, 204.
subinvolution with, 226.
Anteponation of uterus, 152.
Anterior column of vagina, 26.
Anteversion of uterus, 149.
examination in, 112.
Antitoxin, diphtheria, 280.
Anus, imperforate, 127.
Apostoli's treatment of fibromyomata, 315.
vaginal electrode, 513.
Appendicitis, complicating hysterectomy, 460.
cystitis with, 401.
Appendicitis
diagnosis of, 341.
infection of fibromyomata from, 326.
infection of ovarian cyst from, 349.
involving genital organs, 274, 406.
pelvic inflammation spreading from, 156, 339.
tuberculous, tuberculous peritonitis arising from, 409.
Appendicostomy, 407.
Appendiculo-tubal abscess, 274.
Appendix vermiformis, *see* 'Appendicitis.'
in pelvis, 29, 274.
Arbor vitae, 46, 49, 139.
Areola, mammary, in pregnancy, 83.
Argyrol for cystitis, 400, 402.
for gonorrhoea, 255, 256, 257.
Arteriosclerosis of uterine arteries, 199, 214.
Artery, azygos, 62.
dorsalis clitoridis, 62.
external pudic, 61.
internal pudic, 61.
ovarian, 62, 65, 471.
in thrombo-phlebitis, 270.
pulmonary, incision of in thrombosis, 434.
superficial external pudic, 62.
superficial perineal, 62.
to the bulb, 62.
transverse perineal, 62.
uterine, 53, 62, 142, 456, 459.
in pregnancy, 83.
vaginal, in pregnancy, 83.
Arthritis, gonorrhoeal, 254.
Artificial menopause, 211.
Ascites, 289, 340.
detection of, 98.
physical signs of, 104, 106, 107.
with adenocarcinoma of Fallopian tube, 384.
adenoma of Fallopian tube, 332.
carcinoma of ovary, 387.
fibroma of ovary, 352.
general peritonitis, 272.
papillary carcinoma of ovary, 389.
papillomatous cysts of broad ligament, 332.
papillomatous cysts of ovary, 344.
rupture of ovarian cyst, 350.
sarcoma of ovary, 390.
tuberculous peritonitis, 409.
Athyroidism, 194.
Atresiae of genital tract, 123.
amenorrhoea with, 193, 195.
sterility with, 217.
Atrophy of fibromyomata, 320.
Atropine before anaesthesia, 416.
for ether bronchitis, 424.

Autolysis of uterine muscle in subinvolution, 226.
Auvard's curette, 500.
Aveling's repositor, 188.

Bacillus aërogenes capsulatus, 279.
coli communis, 263, 264, **273**, 279, 281, 349, 400, 402.
diphtheria, 279.
Ducrey's, 262.
proteus, 400.
tetanus, 280.
tuberculosus, **275**, 401, 409.
in urine, 402.
typhoid, 280.
vaginae, 67.
Backache, with fibromyomata uteri, 311.
with prolapse, 172.
retroflexion, 156.
tubo-ovarian cysts, 295.
Bacterial resistance, reduced in menstruation, 76.
Ballottement, external, 85.
internal, 84.
Bandages, 415.
Barnard's apparatus for subcutaneous infusions, 436.
Barnes' bag, 187.
Bartholin's duct, retention cysts of, 283.
glands, 60, 67.
abscess of, 132, 245, 272, 284, 475.
adenoma of, 299.
carcinoma of, 356.
cysts of, 132, 283, 284, **475**.
gonorrhoea of, 244, **245**.
growths of, 284.
Bartlett's method of catgut sterilization, 444.
Bedsores, 374.
Belladonna for enuresis, 399.
for mammary pain, 210.
Bicornuate uterus, *see* 'Uterus bicornis.'
Bilateral hermaphroditism, 129.
Bimanual palpation, 109, 112. (*See also* 'Palpation.')
Biniodide of mercury solution, 414, 419, 420, 421, 422, 441, 474, 479.
Bivalve speculum, 107, 109.
Bladder, in abdominal operations, 452.
anatomy and relations of, 53, 56, 57, 61.
atony of, 403.
in carcinoma of cervix, 369, 372, 374.
in colporrhaphy, 487.
development of, 20.
distension of, 99, 104, 157, 166, 342.
in epispadias, 128.
examination of, 115, 116.
fascia of, 34.
in fibromyomata of uterus, 307, 311.

Bladder
fistulae of, **145**, 369, 374.
repair of, 490.
foreign body in, 116, 400, 401.
in hysterectomy, 456.
vaginal, 504, 508.
in hysterotomy, 502.
infection of, *see* 'Cystitis.'
neoplasms of, 151, 166, **398**.
in ovarian tumours, 338, 339.
pelvic cellulitis, 151, 268.
pregnancy, 82, 403, 464.
vaginal neoplasms, 300.
prolapse, 182.
vaginectomy, 494.
ventrifixation, 164, 463.
veins of, 63.
vicarious menstruation from, 210.
Blastocyst, 79.
Blood diseases, 398.
moles, 236.
pressure in menstruation, 73.
with pituitary (infundibular) extract, 213.
in secondary haemorrhage, 427.
sepsis, 427.
shock, 426, 427.
uraemia, 427.
Body of uterus, *see* 'Uterus, body of.'
'Bootlace' suture, 455.
Bowel, protrusion into vagina, 427.
Braces, operation, 416.
Breasts, changes in pregnancy, 83.
enlargement at puberty, 68.
method of examining, 97.
pain in, during menstruation, 210.
Bright's disease, menorrhagia in, 202, 398.
Broad ligament, *see* 'Ligament, broad.'
Bromidia, 416, 420.
Bronchitis, postanaesthetic, 419.
postoperative, 430.
Bulbus vestibuli, 60.
artery to, 62.
nerves of, 65.
veins of, 63.
Burri's stain, 258.

Cachexia in carcinoma cervicis, 372.
Caecum, dilatation of, 404.
Caesarean section, 143, **468**.
in carcinoma of cervix with pregnancy, 371.
fibromyoma of uterus with pregnancy, 318, 319, 320.
ovarian tumour with pregnancy, 352.
'vaginal,' 502.
Calcareous 'degeneration' of fibromyomata, 324.
Calcification of fibromyomata, 324.
Calcium (lactate), for acute illness, 198.
for amenorrhoea, 198, 200.
bleeding with fibromyomata, 327.
delayed puberty, 191.

Calcium (lactate)
for dysmenorrhoea, 203.
enema rash, 424.
Graves' disease, 202.
hyperlactation, 202.
hystero-epilepsy, 209.
'membranous dysmenorrhoea,' 206.
menopause, 212.
menorrhagia, 200.
subinvolution, 227, 240.
Calcium metabolism, 67, 69.
influence on constipation, 406.
influence on menstruation, 77.
influence on rupture of Graafian follicle, 78.
in vicarious menstruation, 210.
Calcium salts, deficiency of, subinvolution with, 226.
in egg-shells, 4, 5.
menstrual discharge, 73.
influence on uterine contractions, 87.
Calculi, vesical, 400, 401.
Calmette's reaction, 410.
Calomel for intestinal paresis, 431.
after operation, 420.
Carbolic acid for intrauterine application, 256.
Carcinoma, of body of uterus, 375.
complicating fibromyomata, 326, 459.
diagnosis in, 313, 382.
hysterectomy for, 456, 502.
inversion with, 189.
perforation in, 141.
resembling sarcoma, 381.
of cervix, 361.
colostomy in, 369.
diagnosis of, from chancre, 259.
from erosion, 301.
tuberculous ulcer, 276.
infection of, 272.
lacerations predisposing to, 139.
operations for, 455, 457, 492, 512.
with pregnancy, 370.
sterility with, 222.
of clitoris, 354.
operation for, 478.
of Fallopian tube, 385, 409.
large intestine, 408.
ovary, 386.
ovarian cysts, 350.
vagina, 360.
vulva, 354, 411.
operation for, 477.
Cardiac disease, menorrhagia with, 201.
distress at menopause, 211.
Carneous moles, 236.
Caruncle, urethral, 297.
operation for, 478.
Carunculae myrtiformes, 26, 219.
Case-taking, 92.
Casts of uterus, 204, 206, 207.
of vagina, 144.
Catgut, **443**, 454, 457, 462, 463, 469, 470, 471, 472, 476, 479, 487, 508, 509.
chromic, 443, 487, 490, 491, 495, 497, 498, 503, 504, 507.
tetanus from, 280.
Catheter, 416, 421, 438, 490.
Cauterization, electric, 511.
Cavernous plexus, 65.
Cavity of uterus, 45.
Cell nests, 355, 363.
Cellulitis, pelvic, 139, 140, 151, 167, 263, 264, **267**, 270.
Cervicitis, 139, 246, 257, 288, 366, 372, 497.
Cervix uteri, 44, 45.
adenocarcinoma of, 367.
age differences in, 49.
amputation of, 120, 139, 257, 288, 302, **497**, 501.
anatomy of, 26, 45.
atresia of, 123, **124**.
in backward displacements, 153.
bimanual palpation of, 112.
blood supply of, 62.
carcinoma of, *see* 'Carcinoma of cervix.'
climacteric changes in, 91.
colouration of, in pregnancy, 82.
in thrombo-phlebitis, 270.
congenital hypertrophy of, 119, 497.
congenital stenosis of, 120.
operation for, 495.
conical, 120.
sterility with, 217.
dilatation of, 499.
for abortion, 223.
abortion, incomplete, 224.
in Caesarean section, 469.
for congenital retroflexion, 153.
dysmenorrhoea, 204.
gonorrhoea, 256, 257.
uterine mole, 236.
epithelioma of, 361. (*See also* 'Carcinoma.')
epithelium of, 51.
fibromyoma of, 168, 170, 180, **307**.
in forward displacements, 149.
glands of, 47, 367.
gonorrhoea of, 245, **246**.
hypertrophy of, 119, 170, 173, 180, 497.
in hysterotomy, 502.
infective ulcers of, 301.
in inversion, 184.
laceration of, 138, 142, 301, 366, 372.
amputation for, 497.
repair of, 139, 494.
lymphatics of, 63.
in menstruation, 72.
operations involving, 456, 457, 494, 495, 497, 499, 500, 501, 502.
polyps of, 311, 318.
retention cysts in, 288.
sarcoma of, 375.

Cervix uteri
secretion of, in gonorrhoea, 246.
sloughing of, 145.
softening of, in pregnancy, 83.
stenosis of, dysmenorrhoea in, 203.
structure of, 50.
syphilis of, 259.
tuberculosis of, 275, 276.
Champetier de Ribes' bag, 188.
Chancre, Hunterian, 259.
soft, 262.
'Chill,' 211.
cystitis after, 401.
secondary amenorrhoea after, 197.
Chinese twist (silk), 442.
Chloretone for tetanus, 280.
Chloroform, 417.
Chlorosis, secondary amenorrhoea with, 196.
sterility with, 217.
Chorionepithelioma, 79, 81, **378**.
diagnosis in, 382.
of Fallopian tube, 385.
lutein cysts, association with, 344.
of ovary, 389.
uterus, 378.
vagina, 361.
following vesicular mole, 240.
Chorion, villi of, 80, 205, 223, 224, 232, 237.
Chromic catgut, *see* 'Catgut, chromic.'
Chronic diseases, menorrhagia with, 200.
Citric acid for thrombosis, 434.
Climate, cause of sterility, 217.
change of, amenorrhoea with, 197.
Clitoris, anatomy of, 24.
deformity of, 128.
development of, 21.
dorsal artery of, 62.
dorsal vein of, 32.
epithelioma of, 354.
operation for, 477.
epithelium of, 60.
in epispadias, 128.
hypospadias, 129.
nerves of, 65.
structure of, 60.
syphilis of, 259.
veins of, 32, 63.
Cloaca, 2, 19.
persistent, 128, 129.
Clover's crutch, 474.
Cocaine in vaginismus, 219.
Coccydynia, 405.
Cochleate uterus, 149.
Colic, uterine, 203.
Collapse, 426.
in rupture, of tubal pregnancy, 231.
of uterus, 143.
Colles' law, 261.
Colostomy, in carcinoma of cervix, 369.
Colporrhaphy, 174, 182, 422, **485**.
anterior, 486.
posterior, 488.
Complete internal inversion, 184.
inversion, 184, 189.
pseudohermaphroditism, 130.
Complications of abdominal operations, 426.
of vaginal operations, 427.
Condylomata, 259.
Congenital anteflexion of uterus, 149.
flexions, dysmenorrhoea with, 203.
sterility with, 217.
inclusions in ovary, 352.
origin of herniae, 147.
prolapsus uteri, 170.
retroflexion of uterus, 153, 158.
retroversion of uterus, 153.
stenosis of cervix, 120, 217, 495.
Conical cervix, 120.
Constant current, 510.
Constipation, chronic, 170.
with dysmenorrhoea, 208.
fibromyomata, 311.
pelvic peritonitis, 248.
Contractions, uterine, **86**, 226, 376.
with fibromyomata uteri, 310.
influence of calcium metabolism on, 70.
influence of ductless glands on, 89.
in labour, 86.
paraplegia, 393.
pregnancy, 84, 86.
Copraemia, 406.
Corpus albicans, 40, 91.
Corpus luteum, **40**, 68, 71, 344, 352.
abortion after destruction of, 222.
Corpus uteri, *see* 'Uterus, body of.'
Cotarnine phthalate for menorrhagia, 201.
Creolin, 490.
Crypts of vagina, 57.
Curette, blunt flushing, 500.
perforation by, 140.
sharp flushing, 500.
Curettement, 150, 155, 421, 422, 499, **500**.
for adenocarcinoma of body of uterus, 378.
adenoma of uterus, 305, 306.
dysmenorrhoea, 203, 204.
fibrosis uteri, 208.
haemorrhage at the menopause, 212.
incomplete abortion, 224.
'membranous dysmenorrhoea,' 206.
subinvolution, 227.
Current, constant, 510.
Faradic, 513.
Morton wave, 513.
static, 513.
Currents, peritoneal, 79.
Cusco's speculum, 107, 109.
'Cystic' degeneration of fibromyomata, 320.
Cystitis, 399.
after abdominal operations, 424.
with carcinoma of cervix, 369.

Cystitis
enuresis in, 398.
gonorrhoeal, 245.
with malignant disease of uterus, 404.
pregnancy, 403.
tuberculous, 401.
Cystocele, 169, 176, 181, 286, 485, 486, 487.
Cystoscope, 115, 145, 402.
Cysts, of broad ligament, 289, 332.
hydatid, 282.
of Kobelt's tubules, 291.
mesentery, 341.
ovary, *see* 'Ovary, cysts of.'
peritoneum, 292.
urethra, 287.
uterus, 288.
vagina, 285.
origin of, 61.
removal of, 491.
vulva, 283.
Cyto-trophoblast, 80.

Dabs left in abdomen, 430, 432, 453.
Debility, menorrhagia with, 200.
Decapsulation of kidney, 432.
'Decidua reflexa,' 79.
Decidual cells, 224, 232, 378.
membrane, 205, 223, 232.
reaction, 79, 205, 232.
in tubal pregnancy, 229.
Deciduoma malignum, *see* 'Chorion-epithelioma.'
Degenerations of fibromyomata, *see* 'Fibromyomata.'
Delayed puberty, 191.
Deponation of uterus, 169. (*See* 'Prolapsus uteri.')
Dermoid cysts, implantation, 286.
of ovary, 344.
diagnosis of, 151.
suppuration in, 350.
'Descent' of genital organs, 15.
Development, of bladder, 20.
of broad ligament, 16.
clitoris, 21.
external genitalia, 21.
Fallopian tubes, 13.
fraenum clitoridis, 22.
Graafian follicle, 11.
hymen, 22.
labia majora, 22.
labia minora, 22.
ligament of ovary, 16.
mesosalpinx, 14, 16.
mons Veneris, 22.
Müllerian duct, 9.
ovary, 10.
parovarium, 14.
posterior commissure, 22.
prepuce, 22.
round ligament, 16.
urethra, 20.
uterus, 13.
vagina, 19.
Development of Wolffian body and duct, 9, 14.
Diabetes, 397, 410.
Diarrhoea, 264.
Didelphic uterus, *see* 'Uterus didelphys.'
Dietl's crises, 404.
Dilatation of cervix, 499. (*See also* 'Cervix uteri, dilatation of.')
Dilator, uterine, 499.
perforation by, 140.
Diphtheria of vulva, 273, **279**.
'Dipping,' physical sign of, 104.
Discus proligerus, 40, 78.
Displacements of uterus, 148.
dysmenorrhoea with, 206.
menorrhagia with, 199.
Diverticula, intestinal, 407.
Döderlein's bacillus, 241.
Dorsal position, 107, 110.
Douche-can, 161.
Douche, intrauterine, after abortion, 224.
in infected fibromyomata, 325.
inversion, 186.
vaginal, 161.
in carcinoma of cervix, 373.
cellulitis, 268.
fibrosis uteri, with dysmenorrhoea, 208.
gonorrhoea, 257.
hot, abortion following, 222.
after menstrual retention, 193.
after operations, 422.
before operations, 420.
in perimetritis, 269.
with pessaries, 177.
in pregnancy, 165.
prolapse, 178.
solutions for, 162, 178.
in subinvolution, 227.
Douglas, pouch of, 28, 45, 147, 148, 234, 254, 257, 307, 311, 313, 338, 339, 340, 370, 430, 467, 472, 504, 509.
anatomy of, 29.
Downward displacements of uterus, 169. (*See* 'Prolapsus uteri.')
Doyen's retractor, 452.
Drainage of abdomen, 138, 141, 278, 410, 431, 432, **449**.
Drug habits, amenorrhoea in, 198.
Dysmenorrhoea, **202**, 518.
with acquired pathological lesions, 206, 519.
adenomyoma of uterus, 318.
constant current for, 512.
with distension of uterus by clots, 203.
exfoliation of endometrium, 204.
fibromyomata of uterus, 310.
forward displacements, 149.
imperfect physiological processes, 203.
imperfect wave of muscle contraction, 203.

Dysmenorrhoea
'membranous,' 204.
morphia in, 209.
with neuroses, 395.
retroflexion, 153.
retroversion, 153, 156.
static current for, 513.
with tubo-ovarian cysts, 295.
Dyspareunia, 218.
with atresia of vagina, 125.
of labia, 127.
with carcinoma of vagina, 360.
caruncle, 298.
causes of, 219.
with kraurosis vulvae, 214, 220.
with prolapsed ovaries, 148, 220, 396.
resistant hymen, 127.
salpingitis, 253.
sterility with, 217.
with tubo-ovarian cysts, 295.
Dystocia, after vaginal fixation, 164.
after ventrifixation, 164.
Dysuria, 521.
with atresia of labia, 127.
bladder tumours, 398.
carcinoma of cervix, 369.
caruncle, 298.
cystitis, 400.
fibromyomata, 311.
gonorrhoea, 245.
ovarian cysts, 338.
prolapse, 172.
retained menses, 125.
tuberculous cystitis, 402.
vaginal tumours, 300.
Duckbill speculum, 107.
Ducrey's bacillus, 262.

Eclampsia, abortion in, 221.
Ectopia genitalium, 18, 122.
vesicae, 128.
Ectopic pregnancy, 228.
abdominal, 229.
amenorrhoea in, 198.
cause of, 79.
rupture, 80.
chorionepithelioma of Fallopian tube after, 385.
decidual cast in, 205.
diagnosis from ovarian cyst, 340, 342.
retroverted fundus, 158.
salpingitis, 234.
infection of, from bowel, 274.
lateral displacements with, 167.
ovarian, 229.
posterior vaginal section for, 509.
prolapse of ovary with, 147.
rectal fistula resulting from, 114.
in rudimentary horn of uterus bicornis, 122, 221, 236.
rupture of, 230.
salpingectomy for, 472, 473.
superponation with, 169.
treatment of, 234.
Ectopic pregnancy
tubal, 229.
tubal abortion, 231.
X-rays in diagnosis of, 116.
Ectropion of cervical mucosa, *see* 'Eversion.'
Eczema of vulva, 410.
Egg-shell calcification of fibromyomata, 324.
Egg-shells, calcium salts in, 4, 5.
Electrical osmosis, 512.
treatment of amenorrhoea, 512.
of constipation, 407.
dysmenorrhoea, 203, 204, 512, 513.
fibromyomata, 315.
menorrhagia, 200, 512.
subinvolution, 227, 512.
superinvolution, 227.
Electrodes, external, 510.
internal, 511, 513.
Electrolysis, 511, 512.
Electrotherapeutics in gynaecology, 510.
Elephantiasis Arabum, 281.
false, 260.
Emboli, septic, 433.
Embolism in carcinoma of cervix, 372.
Embryonic cells, action of X-rays on, 514.
Encysted hydrocele, 284.
Endocarditis, gonorrhoeal, 254.
Endocervicitis, 497.
Endometritis, abortion with, 222.
electrical treatment of, 512.
gonorrhoeal, 246, 247.
'senile,' **214**, 383.
septic, 264.
sterility with, 222.
Endometrium, 45, **47**.
adenoma of, **302**, 310, 328.
with fibromyomata, 310, 317.
sterility with, 217.
age differences in, 49.
atrophy of, compression—in fibromyomata, 307.
menopausal, 214.
in carcinoma of body of uterus, 375.
decidual reaction of, in ectopic pregnancy, 232.
exfoliation of, 204.
in fibrosis uteri, 265.
implantation of ovum in, 79.
infection of, 246, 264, 273.
glands of, 47, 49.
glandular hyperplasia of, 304.
hypertrophy of, 305.
in gonorrhoea, 246.
haemorrhages in, 212.
in 'membranous dysmenorrhoea,' 205, 206.
during menstruation, 71, 73.
oedema of, 155.
portion saved in hysterectomy, 316, 459.
structure of, 47.

Endothelioma of body of uterus, 380, 381, 382.
of ovary, 389.
Endothelium of lymphatic cysts of vagina, 287.
Enema, olive oil, 407, 491.
rash, 424.
terebinthinae, 420, 428, 431.
Enteroptosis, 404.
Enucleation of fibromyomata, 323, 325.
Enuresis, 398.
Environment, 94.
cause of secondary amenorrhoea, 197.
of delayed puberty, 191.
Epilepsy, menstruation in, 209. (*See also* 'Hystero-epilepsy.')
Epispadias, 128.
Epithelioma of cervix, 361. (*See also* 'Carcinoma.')
of vulva, 354.
Epithelium of adenocarcinoma of body of uterus, 329, 375.
of adenomyoma of uterus, 328.
carcinoma of ovary, 387.
cervix, 49, 361, 367.
clitoris, 60.
cysts of Gartner's duct, 289.
cysts of labium minus, 283.
cysts of parovarium, 289.
dermoid cysts, 346, 347.
embryonic cysts of uterus, 289.
endometrium, 47, 71.
in 'membranous dysmenorrhoea,' 206.
during menstruation, 73, 75.
'erosion,' 301.
Fallopian tubes, 44.
in gonorrhoea, 251.
'germinal,' 10, 12, 37, 40, 91, 386.
of hymen, 57.
implantation dermoids of vagina, 286.
intracystic papillary cysts of ovary, 344.
labia minora, 60, 214.
in leucoplakia, 412.
of papillary carcinoma of ovary, 387.
paroöphoron, 53.
parovarian papillary cysts, 333.
pseudomucinous cystadenoma of ovary, 335.
serous cystadenoma of ovary, 337.
urethra, 61.
urethral caruncle, 298.
vagina, 57.
vaginal gland retention cysts, 287.
vulva, in kraurosis, 215.
Wolffian cysts, 286.
duct and tubules, 53.
Epoöphoron, 14, 52.
Ergot (or Ergotin) for abortion, 224.
after Caesarean section, 469.
after rupture of uterus, 143.
for shock, 426.
subinvolution, 227.
after hydatidiform mole, 240.
'Erosion,' 199, **301**, 365.
syphilitic, 259.
Esthiomène, 260.
Ether bronchitis, 419, 424.
open method of administration, **417**, 423.
Eversion of cervical mucosa, 139, 365.
Examination, of nulliparae, 111.
of the patient, 95.
methods of, 96.
Exfoliation of endometrium, 204.
Exophthalmic goitre, 393.
at menopause, 212.
menorrhagia with, 201.
External genitalia, blood supply of, 61.
development of, 21.
structure and relations, 57.
External pseudohermaphroditism, 130.
Extratubal abscess, 251, 274.
Extrauterine pregnancy, 228. (*See also* 'Ectopic pregnancy.')

Faecal collections in the bowel, 113, 148.
Fainting in pregnancy, 82.
Fallopian tube, **43**, 46.
abnormal attachment to uterus, 119.
absence of, 120.
accessory, 118.
actinomycosis of, 282.
adenocarcinoma of, 384.
ampulla of, 43.
anatomy of, 27, **43**.
in appendicitis, 274.
artery to, 62.
bacteriology of, 241.
bimanual palpation of, 113.
in broad ligament cysts, 291, 292.
carcinoma of, 409.
climacteric changes in, 91.
chorionepithelioma of, 385.
cysts of, 293.
defects of, 121.
descent of ovum down, 79.
development of, 13.
displacements of, 147.
distension of, 126.
excision of, 472.
fimbriae of, *see* 'Fimbriae.'
gonorrhoea of, 243, **247**, 254.
hernia of, 147.
hydatid cyst of, 282.
of Morgagni attached to, 53.
infection of, 247, 267, 273, 276.
in chronic constipation, 407.
infundibulum of, 43.
injury of, 146.
innocent growths of, 331.

Fallopian tube
in inversion of uterus, 184, 185, 186.
isthmus of, 44.
lymphatics of, 63.
in male pseudohermaphroditism, 130.
malformations of, 118.
malignant disease of, 384.
during menstruation, 72.
ostium abdominale of, 43, 257, 332.
in ovarian cysts, 334.
ovarian pedicle sutured beneath, 471.
in panhysterectomy, 456.
pars uterina of, 44.
pregnancy in, 228, 229.
prolapse of, 147.
in tubal pregnancy, 230.
in prolapsus uteri, 172.
rupture of, 230.
sarcoma of, 385.
secretion of, 67, 79.
sterility in disease of, 216.
structure of, 44.
supernumerary, 118.
tuberculosis of, **276**, 278, 409.
in vaginal hysterectomy, 505.
Faradic current, 513.
Fascia, of labia majora, 31.
of mons Veneris, 31.
pelvis, 30.
vagina, 34, 56.
Fatty degeneration of fibromyomata, 322.
Femoral hernia, 147, 182.
Fergusson's speculum, 109.
Fevers, acute, 397.
Fibroma, of ovary, 351.
of round ligament, 331.
uterus, 308.
vagina, 300, 491.
vulva, 296.
Fibromyoma, of Fallopian tube, 332.
of ovary, 351.
of round ligament, 331.
of uterus, 306.
abdominal contour in, 98.
abortion with, 221.
anteversion with, 151.
in broad ligament, 167, **333**, 460.
calcareous 'degeneration' of, 324.
complications of, 317.
cystitis with, 403.
degenerations of, 320.
diagnosis, 114, 158, 268, 312, 331, 339, 377.
endothelioma, associated with, 382.
enucleation of, 461.
fatty degeneration of, 322.
glandular hypertrophy of endometrium with, 305.
haemorrhage from subperitoneal, 234.
Fibromyoma, of uterus
haemorrhage into, 322, 325.
infection of, 325.
insanity with, 394.
inversion with, 189.
menorrhagia with, 199, 310.
myxomatous degeneration of, 324.
panhysterectomy for, 456.
polypoid, removal of, 501.
prolapse of uterus with, 180.
'red degeneration' of, 322.
retention cysts of endometrium with, 288.
sarcoma, associated with, 380.
sterility with, 222.
submucous, dysmenorrhoea with, 208.
sloughing, 263, 272, 363, 376, 380, 382.
superponation with, 168.
supravaginal hysterectomy for, 459.
torsion of, 324.
treatment of, 315.
X-rays in, 514.
Fibrosis uteri, 214, **265**, 305.
dysmenorrhoea with, 208.
Filaria sanguinis hominis, 281.
Fimbriae, of accessory ostia, 119.
of Fallopian tube, 27, 37, **43**, 53, 79, 289, 291.
absence of, 120, 122.
in gonorrhoeal infection, 248, 249.
Finger-grip forceps, 465.
Fistulae, 145.
abdominal, with ectopic pregnancy, 234.
faecal, 278, 450.
rectal, with ectopic pregnancy, 114, 234.
recto-vaginal, 145, 273, 276, 369, 374.
repair of, 491.
repair of, 488.
uretero-vaginal, 145, 490, 508.
utero-intestinal, 145.
utero-vesical, 145.
vaginal, with ectopic pregnancy, 234.
vesical, 234, 367, 398, 427.
vesico-intestinal, 401.
vesico-vaginal, 145, 276, 374, 403.
repair of, 488.
Flexions of uterus, 148.
Floating kidney, 404.
'Flooding,' at menopause, 212.
previous to superinvolution, 227.
'Flushes' during menopause, 89, 211.
Foetal heart sounds, 85, 105, 237.
membranes, 205.
peritonitis, 120.
syphilis, 261.
Foetus, death of, abortion on, 221.
Forceps, finger-grip, 465.

Forceps
injuries by midwifery—, 135, 137, 138.
by ovum—, 141.
volsellum, 114, 459.
Foreign body in bladder, 400, 401.
X-rays in diagnosis of, 116.
Fornix vaginae, 26, 91.
Fossa navicularis, 26.
ovarica, 36.
Fourchette, anatomy of, 24.
adenoma of, 299.
laceration of, 133.
syphilis of, 259.
Fowler's position, 138, 272, 430, 431.
Fraenum clitoridis, 22, 24.
'Freshening' theory of menstruation, 77, 78.
Friction, abdominal, 106.
'Functional' diseases, 94, 393.
Fundus uteri, 44.
anatomy of, 26.
bimanual palpation of, 112.
laceration of, 142.
'Fungous' adenoma of endometrium, 305.

Gall bladder, distended, 342.
Gartner's duct, 14, 52.
cysts of, 285, **289**, 291, 292.
papillary cysts of, **332**, 339.
Gas-forming infection, 279.
Gauze drainage, 449, 469, 476, 500, 501.
Genital cord, 13.
fold, 16.
folds, external, 22.
internal, 22.
Genitalia, sterility in absence of, 216.
external in pseudohermaphroditism, 130.
Genital mesentery, 16.
organs, changes in during menstruation, 71.
pore, 2.
ridge, 9.
tract, infections of, 242.
tubercle, 21.
tubules, 14.
Genufacial position, 115.
in treatment of malpositions, 158, 159.
'Germinal' epithelium, 10, 12, 37, 40, 91, 386.
Gestation, duration of, 81.
Giddiness in pregnancy, 82.
Giemsa's stain, 258.
Gilliam's operation, 165, 174, 176, 178, **463**, 467.
Glands, of Bartholin, *see* 'Bartholin's glands.'
of cervix, 47, 367.
corpus uteri, 50.
ductless, diseases of, 392.
influence on menopause, 89.
on menstruation, 69, 194, 201.
uterine contractions, 89.
Glands
of endometrium, 47, 49, 71, 73, 247.
iliac lymphatic, 63.
inguinal lymphatic, 63.
in adenocarcinoma of body of uterus, 378.
carcinoma of vulva, 360, 477.
epithelioma of clitoris, 354.
of labia majora, 356.
gonorrhoea, 244.
infection from vagina, 21.
sarcoma of vulva, 357, 358.
soft sore, 262.
syphilis, 259.
lumbar lymphatic, 63, 452.
in adenocarcinoma of body of uterus, 378.
of Max Schüller, 61, 287.
mesenteric lymphatic, in tuberculosis, 409.
obturator lymphatic, 63.
pelvic lymphatic, in carcinoma of cervix, 369.
in carcinoma of vulva, 360.
syphilis of cervix, 259.
Wertheim's operation, 458.
sebaceous, of labia, 214.
retention cysts of, 284.
suppuration of, 272.
urethral, in gonorrhoea, 244.
uterine, 67.
during menstruation, 71, 73.
in fibrosis uteri, 265.
after oöphorectomy, 195.
vaginal, 57.
retention cysts of, 287.
Glans clitoridis, 60.
Glass drainage tubes, 449.
Glénard's disease, 178.
Gloves, rubber, 441.
for examinations, 96, 112, 223.
Glucose solution, 420, 432.
Glycerine tampons for dysmenorrhoea, 208.
'Goblet' cells, 335, 408.
Gonococcus, **243**, 258, 263, 402.
Gonorrhoea, 96, 132, 160, **242**, 266, 269, 277.
dyspareunia in, 220.
sterility after, 217.
Gonorrhoeal warts, 244, 297.
treatment of, 257, 514.
Gout, 410.
Graafian follicle, 13, **38**, 40, 43, 69, 76, 91, 208, 234, 334.
development of, 11.
distension of, 292.
haemorrhage from, 210.
maturation of, 78.
Granulomatous caruncle, 298, 299.
Graves' disease, 201, 212, 393.
Guaiacum resin for dysmenorrhoea, 204.
Gummata, 260.

Habitual abortion, 221.
Haematocele, pelvic, anteponation with, 152.
anteversion with, 151.
causes of, 234.
diagnosis of, 234, 340, 342.
from fibromyomata, 326.
from ruptured Graafian follicle, 78, 211.
superponation with, 169.
from tubal pregnancy, 231.
Haematokolpos, 124, **126**.
diagnosis from vaginal cyst, 169.
primary amenorrhoea with, 193.
secondary amenorrhoea with, 195.
with septate vagina, 194.
diagnosis of, 286.
treatment of, 193.
Haematoma of labium majus, **132**, 284, 285.
suppuration of, 272.
Haematometra, 126.
diagnosis from fibromyoma, 314.
in double uterus, 194.
hysterectomy for, 194.
primary amenorrhoea with, 193.
secondary amenorrhoea with, 195.
in torsion of fibromyomatous uterus, 325.
treatment of, 193.
Haematosalpinx, 126.
danger of rupture of, 193.
in ectopic pregnancy, 234.
following traumatic atresiae, 195.
in septate conditions, 194.
Haematuria with cystitis, 400.
with hypernephroma, 341.
tumour of bladder, 151, 398.
Haemolysis in carcinoma, 372.
Haemophilia, menorrhagia with, 200.
Haemoptysis, vicarious menstruation with, 210.
Haemorrhage, in excision of Bartholin's cysts, 475.
from Graafian follicle, 210.
internal, in tubal abortion, 235.
in rupture of tubal pregnancy, 231.
intraperitoneal from fibromyomata, 326.
from lacerations of hymen, 133.
in myomectomy, 461.
into ovary in carcinoma, 387.
ovarian cysts, 335, 349.
in ovarian pregnancy, 229.
resection of ovary, 471.
secondary, 425.
subchorionic, in tubal pregnancy, 230.
uterine, in adenocarcinoma of body, 376.
with carcinoma of cervix, 368, 372.
carneous moles, 236.
chorionepithelioma, 378.
incomplete abortion, 224.
Haemorrhage, uterine
with inversion, 186.
sarcoma of body of uterus, 382.
subinvolution, 227.
previous to superinvolution, 227.
with tubal abortion, 232.
vesicular moles, 237.
in vaginectomy, 492.
Wertheim's operation, 458.
'Haemorrhagic endometritis,' 212.
Haemorrhoidal plexus, 63.
Haemorrhoids, 406.
in pregnancy, 228, 406.
prolapse, 172.
Hair, loss of, in syphilis, 260.
Hands, preparation for examinations, 96.
for operations, 441.
Headache, during menstruation, 76.
during menopause, 211.
Heart disease, menorrhagia with, 201, 398.
Heart sounds, foetal, 85, 105, 237.
Hegar's sign, 83.
Hermaphroditism, 1, 129.
Hernia, of genitalia, 170.
into labia majora, 284.
of ovaries and tubes, 147.
postoperative, 450, 451, 454.
strangulated inguinal, 132.
umbilical, 98.
of uterus, 182.
into vagina, 182.
Herpes of vulva, 410.
Hilum of ovary, 36, 52.
cysts of, 342.
Hippocrates, 210.
Hirsuteness, postclimacteric, 89.
Hodge pessary, 153. (*See also* 'Pessary.')
Holden's perineorrhaphy, 135, **484**, 488, 491.
'Hottentot apron,' 127.
Hunterian chancre, **259**, 358.
Hyaline degeneration of fibromyomata, 320.
Hydatid disease, **282**, 342.
menorrhagia with, 200.
Hydatidiform mole, 236.
chorionepithelioma following, 81, 378.
diagnosis in, 314.
infection after, 239.
subinvolution after, 226, 240.
tubal, 385.
Hydatid of Morgagni, 14, 53, **291**.
Hydramnios, 226.
Hydrocele, of canal of Nuck, 284.
teratological ovarian, 294.
Hydronephrosis, 341, 369.
Hydroperitoneum, *see* 'Ascites.'
Hydrops folliculi, 292.
Hydrosalpinx, **250**, 293, 338.
Hymen, 26, 57.

Hymen
absence of, 127.
atresia of, 124.
development of, 22.
epithelium of, 57.
excision of, 128.
imperforate, 124, 127, 193.
laceration of, 133.
resistant, 127, 218, 219.
Hyperaesthesia of abdomen, 101.
Hyperlactation, menorrhagia with, 202.
Hypernephroma, 341.
Hyperoöphorism, menorrhagia with, 199.
Hyperthyroidism, menorrhagia with, 201, 393.
Hypertrophy of cervix, 119, 170, 173, 180, 497.
Hypnotics at menopause, 214.
Hypogastric plexus, pressure on, 425.
Hypooöphorism, 195.
Hypospadias, 128, 131.
Hypothyroidism, amenorrhoea with, 194.
sexual infantilism with, 392.
Hysterectomy, for adenocarcinoma of Fallopian tube, 384.
for arterio-sclerosis, 214.
carcinoma of cervix, 365, 369, 373.
with pregnancy, 371.
carcinoma of body of uterus, 327.
carcinoma of vagina, 360, 492.
chorionepithelioma, 380.
chronic inversion, 187, 189.
chronic metritis, 257.
cysts of uterus, 289.
fibrosis uteri, 267.
fibromyomata, 306, 316, 502.
infected, 326.
with prolapse, 181.
fistulae after, 146.
for haematometra, 194.
hydatid cysts, 282.
hystero-epilepsy, 210.
perforation of uterus, 141.
'red degeneration' of fibromyomata, 324.
retained menstrual discharge, 194.
rupture of uterus, 143.
sarcoma of cervix, 375.
of uterus, 383.
vagina, 361.
'senile endometritis,' 214.
secondary amenorrhoea after, 195.
for sepsis, 266.
sexual insanity, 192.
tuberculosis, 278.
vaginal malignant growths, 492.
Hysterectomy, abdominal, 316, **455**, 494, 502.
supravaginal, 316, **459**.
vaginal, 187, 189, 214, 365, 422, **502**.
with vaginectomy, 494.
Hysteria, 393.
with prolapsed ovaries, 148.
at puberty, 192.
Hystero-epilepsy, 120, 209.
Hysteropexy, 462.
Hysteroscopy, 108.
Hysterotomy, 500, 501, **502**.
for congenital anteflexion, 150.
dysmenorrhoea, 204.
'membranous dysmenorrhoea,' 206.
uterine cysts, 289.

Ichthyol, in gonorrhoea, 257.
tampons in dysmenorrhoea, 208.
Ileo-sigmoidostomy, 407.
Impaction of uterus, 165, 167.
Imperforate hymen, **124**, 127, 193.
Implantation of ovum, 79.
Impregnation of ovum, 79.
Incision, abdominal, **450**, 456, 463, 465, 468, 470, 472.
paravaginal of Schuchardt, 503.
Incomplete abortion, 224.
Incontinence, of faeces, 129, 137.
of urine, 128, 129, **398**.
Infantile uterus, 149.
Infantilism, 192.
with hypo-hypophysism, 194, 393.
hypothyroidism, 392.
sterility with, 216.
Infections, of fibromyomata, 325.
of genital tract, 242.
neoplasms, 272.
ovarian cysts, 349.
Inflammation of genitalia, menorrhagia with, 199.
Infundibulo-pelvic ligament, *see* 'Ligament, infundibulo-pelvic.'
Infundibulum of Fallopian tube, 43.
of pituitary gland, *see* 'Pituitary gland.'
Infusions, saline, 138, 431.
methods of administration, 435.
rectal, 420, 426, 427, 433, **438**.
subcutaneous, 436.
submammary, 426, **437**.
venous, 425, 426, **435**.
Inguinal canal, 65.
glands, *see* 'Glands, inguinal lymphatic.'
hernia, 132, 147, 182.
Injuries of Fallopian tube and ovary, 146.
of uterus, 138.
vagina and uterus, 137, 143.
vagina and vulva, 132.
Insanity, with fibromyomata, 327.
with menorrhagia, 201.
at puberty, 192.
with secondary amenorrhoea, 197.

Insertion of Hodge and Albert Smith pessaries, 159.
of ring pessary, 180.
Intermediate cell mass, 9.
Intermenstrual pain, 202, 208.
Internal, abdominal ring, 27.
laceration of perineum and vagina, 133.
pseudohermaphroditism, 130.
Interstitial cells of ovary, 12, 69.
Intestinal, paralytic distension, 427.
obstruction, 428.
in carcinoma of cervix, 369.
after oöphorectomy, 471.
ventrifixation, 164.
Intestine, protrusion of, 140, 141, 427.
small, in pelvis, 29.
Intramural fibromyomata uteri, 307, 313.
Intramuscular injections of infundibular extract, *see* 'Pituitary body.'
of mercury for syphilis, 261.
Inversion of uterus, 183. (*See also* 'Uterus, inversion of.')
Involution of the uterus, 226.
Iodine, salts of, for actinomycosis, 282.
for syphilis, 261.
solution of, as antiseptic, 419, 435, 444.
local application of, in gonorrhoea, 257.
in uterine infections, 266.
Iodipin, for syphilis, 261.
Iodoform, 422.
gauze, 501.
Ionization, 512.
of uterus, in fibrosis with dysmenorrhoea, 208.
in membranous dysmenorrhoea, 206.
Iron, in delayed puberty, 191.
in secondary amenorrhoea with chlorosis, 196.
Isthmus of Fallopian tube, 44, 229, 230.
of uterus, 45.

Kelly's bag, 474.
Kelly's perineorrhaphy, 483.
Kidney, abscess of, 117.
belt, Treves', 405.
decapsulation of, 432.
mobile, 101, **404**.
tumours of, 312, 341.
menorrhagia with, 200.
Klebs-Löffler bacillus, 279.
Kny-Scheerer sterilizers, 440.
Kobelt's tubules, 14, 52, 53.
cysts of, **291**.
Kraurosis vulvae, 214.

Labia, atresia of, 127, 131.
climacteric changes in, 91, 214.
oedema of, 220.
Labia majora, adenoma of, 299.
anatomy of, 23.
blood supply of, 62.
development of, 22.
effusion cysts of, 285.
epithelioma of, 354, **356**.
fascia of, 31.
growth of hair on, at puberty, 69.
haematoma of, 132, 284.
hernia into, 131, 132.
lipoma of, 296.
nerves of, 65.
operations on, 475, 476.
sarcoma of, 357.
sebaceous cysts of, 284.
structure of, 60.
syphilis of, 259.
veins of, 63.
warts of, 297.
Labia minora, anatomy of, 23.
carcinoma of, operation for, 477.
cysts of, 283.
lymphatic, 284.
sebaceous, 284.
development of, 22.
epithelioma of, 354, **356**.
epithelium of, 60.
in gonorrhoea, 244.
hypertrophy of, 127.
in kraurosis vulvae, 214.
structure of, 60.
syphilis of, 259.
veins of, 63.
Labour, with malformed uteri, 122.
uterine contractions in, 86. (*See also* 'Parturition.')
Lacerations, of body of uterus, 140.
of cervix, **138**, 142, 301, 366, 372, 494, 497.
fundus of uterus, 142.
hymen, 133.
perineum, 133, 136.
rectum, 133.
vagina, 133, 142.
vaginal septa, 123.
Lactation, amenorrhoea during, 70, 198.
excessive, superinvolution with, 227.
menorrhagia with, 202.
physiology of, 85, 406.
Lacunae in endometrium, 71, 205.
Lambkin's cream, 261.
Langhans' layer, 81, 237, 378.
Laparotomy in tuberculous peritonitis, 410.
Lateral displacements of uterus, 166.
hermaphroditism, 130.
vagina, 124.
Lateriflexion of uterus, 112.
Lavage, 429.
rectal, 407.
Left latero-prone position, 107, 108.
Lembert sutures in bladder, 490.
Leucocytosis in pelvic abscess, 269.
Leucoplakia vulvae, 411.
X-rays for, 514.
Leucorrhoea, 67, 70, 519.

Leucorrhoea
with adenoma of uterus, 306.
adenomyoma of uterus, 328.
chronic cervicitis, 288.
'erosion,' 302.
gonorrhoea, 247.
lacerations of cervix, 139.
pessaries, 175.
prolapse, 172.
Ligament, broad, 147.
in adenocarcinoma of cervix, 367, 369.
anatomy of, 26, 35, 37, 45, 46, **51**, 53.
blood vessels in, 62, 63.
thrombosis of, 271.
cellulitis of, 151, 267, 268.
cysts of, 167, 169, 286, **289**, 291, 294, 313, 339, 471.
removal of, 472.
development of, 16, 17.
in eversion of cervix, 366.
fibromyomata of, 334.
in gonorrhoea, 254.
growths (innocent) of, 332.
hydatid cyst of, 282.
invasion of, by carcinoma of cervix, 365, 369.
by fibromyomata of uterus, 307, 311, 312, 313, 460.
by ovarian cysts, 342.
laceration of, 142.
nerves in, 65.
operations involving, 456, 457, 459, 471, 472, 473, 504, 506.
rupture of tubal pregnancy into, 231.
infundibulo-pelvic, anatomy of, 28, 37.
blood vessels in, 62.
development of, 17.
lymphatics of, 63.
in non-descent of ovaries, 118.
operations involving, 456, 471, 473, 474, 506.
in prolapse, 172.
ovarian, anatomy, 28, 37.
development of, 16, 17.
operation involving, 456.
round, in adenocarcinoma of body of uterus, 378.
anatomy of, 27, 28, 36, 52, 284.
artery to, 62.
development of, 16, 17, 18.
innocent growths of, 330.
lipoma in, 296.
lymphatics of, 65.
nerves in, 65.
in non-descent of ovaries, 118.
operations on, 164, 456, **463**, 465, 466, 471, 473.
in parovarian cysts, 291.
uterus didelphys, 122.
suspensory, 31, 35.
'triangular,' 32, 61.
Ligament
utero-sacral, anatomy of, 29, 46.
contraction of, 151.
development of, 17.
in hysterectomy, 456.
shortening of, 164, 178, 467.
vesico-rectal, 122.
Ligatures, materials for, 442.
Linea alba, 451.
Lineae striatae (abdominal), 99.
(mammary), 84.
Lipoma of broad ligament, 333.
of Fallopian tube, 331.
round ligament, 330.
vulva, 296.
Liquor folliculi, 40.
Lithopaedion, 230, 234, 235.
Lithotomy position, 107, **474**.
Lochia, in septic endometritis, 264.
in subinvolution, 227.
Löffler's stain, 258.
Lotio nigra, 261.
'Louping ill,' 280.
Lubricating jelly, 108.
Lupus of vulva, 275.
Lutein cells, 40, 344.
Lutein cysts, 344, 380.
Luys' method of separation of urine in diagnosis, 341.
Lymphatic cysts of labia minora, 284.
of vagina, 287.
Lymphatics of genitalia, 63.

Malformations of genitalia, 117.
Malignant diseases, of Fallopian tubes, 384.
of ovary, 386.
uterus, **361**, 458.
vagina, 360.
vulva, 354.
melanoma of vulva, 357.
neoplasms of genital tract, 354.
Marriage, secondary amenorrhoea after, 197.
'Massive infusions,' 438.
Mastitis in mumps, 398.
Masturbation, 192, 201.
Mayo Robson's catgut sterilizer, 444.
Measles, noma after, 398.
Melancholia after oöphorectomy, 210, 395.
'Melanotic sarcoma' of vulva, 357.
Membrana granulosa, 11, 13, **38**, 40, 78, 292, 334.
Membranes, decidual, 205.
foetal, 205.
premature rupture of, 138.
'Membranous dysmenorrhoea,' 204. (See *also* 'Dysmenorrhoea, membranous.')
ulcers of labia majora, 273.
Menopause, disorders of, 211.
fibromyomata at, 315.
fibrosis in, 266.
menorrhagia at, 202.
metabolism of, 211.
physiology of, 87.

Menopause
secondary amenorrhoea at, 198.
symptoms of, 211.
Menopausal symptoms after hysterectomy, 195.
Menorrhagia, **199**, 515.
causes of, extragenital, 200.
general, 200.
local, 199.
with adenoma of uterus, 302, 305, 306.
adenomyoma of uterus, 328.
arteriosclerosis, 214.
cysts of body of uterus, 289.
constant current for, 512.
in fevers, 398.
with fibromyomata uteri, 308, 310.
fibrosis uteri, 214, 265, 267.
in heart disease, 201, 398.
hyperthyroidism, 393.
with inversion, 186.
'membranous dysmenorrhoea,' 205.
at menopause, 212.
with ovarian tumours, 338, 351, 387.
prolapse, 172.
in psychoses, 394.
with puerperal retroflexion, 155.
in retroflexion, 156.
with salpingitis, 257.
treatment of, 200, 512.
Menstruation, 67.
bleeding stage, 71.
blood pressure during, 73.
calcium metabolism and, 69, 77.
in delayed puberty, 191.
endometrium during, 47.
epilepsy with, 209.
examination during, 95.
with fibromyomata uteri, 306.
general conditions associated with, 73.
with gonorrhoea infection, 247.
after supravaginal hysterectomy, 459.
with malformed uteri, 122.
marriage, effect of on, 94.
at menopause, 89.
without ovulation, 77.
pain with, *see* 'Dysmenorrhoea.'
physiology of, 76.
in precocious puberty, 191.
premenstrual stage, 71.
in pseudohermaphroditism, 131.
pulse rate in, 73.
recuperation stage, 73.
resting stage, 73.
with salpingitis, 253.
in superinvolution, 227.
temperature in, 73.
theories concerning, 76, 77.
uterine contractions during, 86.
vicarious, 210.
Menstrual discharge, 70.
retention of, 124, 193.
Menstrual molimina, 125, 210.
Mensuration, abdominal, 106, 340.
Mental disturbances, abortion in, 221.
symptoms at menopause, 212.
Mercury, biniodide of, *see* 'Biniodide.'
in syphilis, 261.
Mesentery, cysts of, 341.
genital, 118.
urogenital, 9, 13, 16, 17, 19, 118.
Mesometrium, 17. (*See also* 'Ligament, broad.')
Mesonephros, 14.
Mesosalpinx, 17, 43, 52.
development of, 14, 16.
Mesovarium, 10, 16, 36.
Metabolism, calcium, 67, 69, 77, 78, 210, 406.
of menopause, 211.
and temperament, 393.
Metastases, in adenocarcinoma of body of uterus, 378.
in carcinoma of cervix, 372.
chorionepithelioma, 378.
malignant disease of ovaries, 389, 390.
mumps, 253.
Methods of examination, 96.
Metritis, acute gonorrhoeal, 246.
chronic, 151, 170, 265.
chronic fibrotic, 247, 257.
Metrorrhagia, 199.
Metrostaxis, **199**, 515. (*See also* 'Haemorrhage, uterine.')
in adenoma uteri, 302, 306.
adenomyoma uteri, 328.
arteriosclerosis, 214.
fevers, 398.
fibromyomata uteri, 308, 310.
fibrosis uteri, 214, 265, 267.
inversion, 186.
puerperal retroflexion, 155.
retroflexion with adhesions, 156.
Micturition, frequency of, in carcinoma of cervix, 369.
in cystitis, 400.
fibromyomata uteri, 311.
functional, 398.
in gonorrhoea, 245.
pelvic peritonitis, 248.
pregnancy, 81, 151, 398.
prolapse, 172.
tubal pregnancy, 230.
tuberculous cystitis, 402.
tumours of round ligament, 331.
tumours of vagina, 300.
Mitral stenosis, menorrhagia with, 201.
Moles, blood (carneous), 236.
hydatidiform (vesicular), 81, **236**, 239.
lutein cysts with, 344.
subinvolution with, 226.
tubal, 230, 231.
uterine, 236.
Molimina, menstrual, 125, 210.

Mons Veneris, anatomy of, 23.
blood supply of, 62.
development of, 22.
fascia of, 31.
lipoma in, 296.
nerves of, 65.
at puberty, 68.
sebaceous cysts of, 284.
warts of, 297.
Montgomery's tubercles, 83.
'Monthly abortion' theory of menstruation, 77.
Morgagni, hydatid of, 14, 53, **291**.
Morning sickness in pregnancy, 82, 84.
Morphia, cause of secondary amenorrhoea, 198.
in dysmenorrhoea, avoidance of, 209.
at menopause, 214.
after operation, 420, 428.
for ruptured uterus, 143.
Morton wave current, 513.
Mucous papules (gonorrhoeal), 244.
(syphilitic), 297.
Müllerian ducts, 9, 13, 15, 20, 47, 121, 122, 123, 130, 210, 285, 288.
tract, malformations in, 120.
Muscles of pelvis, 30.
Mumps, 398.
metastatic oöphoritis in, 253.
Myoma of Fallopian tube, 332.
of ovary, 351.
uterus, 308.
Myomectomy, 461.
Myxoedema, secondary amenorrhoea with, 198.
sterility with, 217.
suppression of function with, 392.
Myxomatous degeneration of fibromyomata uteri, 324.

Nabothii ovula, 139, 246, 288.
Necrobiosis of fibromyomata uteri, 320.
Needle-holder, 457.
Neoplasms, infection of, 272.
Nephropexy, 405.
Nerve, genito-crural, 65.
ilio-inguinal, 65.
pudic, 65.
Nerves of genitalia, 65. (*See also* 'Plexus (nervous).')
Nervous influences on secondary amenorrhoea, 197.
Neuralgia, pelvic, 512.
Neurasthenia after oöphorectomy, 395.
Neuroma vulvae, 299.
Neuroses, 395.
in fibromyoma uteri, 327.
Noma vulvae, 398.
Normal saline solution, **435**, 444, 452. (*See also* 'Saline infusions.')
Nose, bleeding from at menopause, 211.
vicarious menstruation from, 210.
Nuck, hydrocele of canal of, 284.
Nuck, cyst in canal of, 284.
Nulliparae, examination of, 111.

Obese, examination of the, 95.
Obesity, following menopause, 89.
sterility with, 217.
Oedema, of endometrium, 155, 172.
of legs in fibromyomata uteri, 311.
Oedematous degeneration of fibromyomata uteri, 320, 339.
Olive oil enema, 407, 491.
Omentum, adherent, 470.
strangulation of, 432.
thickened, in tuberculous peritonitis, 409.
in vagina, 427.
Oöphorectomy, 469.
abortion after, 222.
in hystero-epilepsy, 120, 210.
neuroses, 397.
osteomalacia, 77, 393.
secondary amenorrhoea after, 195.
in sexual insanity, 192.
thyroid enlargement after, 393.
Oöphoritis, 152, 234, 249, **251**, 253, 267, 269, 326.
in mumps, 398.
Operation, for artificial vagina, 126, 491.
preparations for, 413.
for prolapse, 178.
table, 448.
for tubal pregnancy, 235.
Operations, abdominal, 445.
on the ligaments of the uterus, 463.
for retroflexion and version, 162, 463, 465.
on vagina, 478.
vulva, 475.
vulva and vagina, 474.
Opium, in carcinoma of cervix, 374.
Osmosis, electrical, 512.
Osteomalacia, 77, 393.
Ostium abdominale, 43, 332.
artificial, 257.
Os uteri, double, 122.
externum, 26, 45.
internum, 45, 49, 149.
'pinhole,' 120, 217.
Ovarian abortion, 229.
apoplexy, 234.
artery, 62, 65.
extract, at menopause, 213.
ligament, *see* 'Ligament, ovarian.'
plexus (nervous), 65.
(venous), 63.
pregnancy, 229.
vein, 63.
Ovariotomy, 469. (*See also* 'Oöphorectomy.')
Ovary, abscess of, 251, 253, 294.
absence of, 117, 193.
accessory, 118.
actinomycosis of, 282.
adhesions to, in chronic constipation, 407.

Ovary
anatomy of, 28, 36.
atrophy of, after hysterectomy, 195, 459.
bimanual palpation of, 113.
blood supply of, 62.
carcinoma of, 386.
chorionepithelioma of, 389.
climacteric changes in, 91.
correlation between—and thyroid, 393.
cystadenoma of, *see* 'Cyst of.'
cyst of, 292, 334, 337.
abdominal contour in, 98.
dulness over, 104.
with chorionepithelioma, 380.
complicating fibromyomata uteri, 326.
complications of, 347.
dermoid, 151, 344.
diagnosis of, 312, 314, 338, 344.
displacement of uterus by, 169.
friction over, 106.
infection of, 251, 269, 274, 281, 349, 352.
inflammatory tubo-ovarian, 294.
innocent, 334, 471.
invasion of, by cancer of intestine, 408.
malignant development in, 387, 469.
menorrhagia with, 199.
oöphorectomy for, 469.
papillary, 342.
prolapse of ovary with, 147.
psychoses with, 394.
retention, 292.
rupture of, 350, 352, 470.
secondary amenorrhoea with, 195.
simple multilocular, 337.
suppuration of, *see* 'Infection of.'
torsion of pedicle of, 347.
treatment of, 350.
cystic teratoma of, 344.
development of, 10.
displacements of, 147.
evolution of, 2.
gonorrhoea, in, 249.
hermaphroditism, in, 129.
hernia of, 147, 182.
hilum of, 53.
hydatid cyst of, 282.
hypersecretion of, 199, 469.
hypertrophy of, 118.
injuries of, 146.
innocent growths of, 334.
solid tumours of, 351.
internal secretion of, 13, 36, 66, 68, 69, 77, 195, 471.
inversion of uterus, in, 184.
lymphatics of, 63.
malignant disease of, 386.
teratoma of, 390.
Ovary
menstruation, relation between—and, 77.
non-descent of, 118.
prolapse of, 147.
dyspareunia with, 148, 220, 396.
psychoses with, 396.
in puerperal retroversion, 155.
'sling' operation for, 165, 465.
sterility with, 217.
prolapsus uteri, in, 172.
pseudohermaphroditism, in, 130.
puberty, changes in—at, 68.
resection of, 471.
rudimentary, 118.
sarcoma of, 389.
secondary amenorrhoea after removal of, 195.
sterility in disease of, 216.
stroma of, 38, 40, 91.
superinvolution, in, 227.
supernumerary, 118.
teratological ovarian hydrocele, in, 294.
tuberculosis of, 277.
tumours of, abortion with, 222.
complicating pregnancy, 352.
cystitis with, 403.
diagnosis in, 158, 234, 312.
displacements of uterus with, 152, 167, 169.
menorrhagia with, 199.
oöphorectomy for, 469.
posterior vaginal section for, 509.
precocious puberty with, 191.
vaginal hysterectomy, in, 505.
vessels of, 37.
Ova, primitive, 10, 11, 12.
Oviducts, evolution of, 2.
Ovoviviparity, 3, 6.
Ovula Nabothii, 139, 246, 288.
Ovulation, before menstruation, 68.
independent of menstruation, 195.
theory of menstruation, 76.
without menstruation, 71, 77.
Ovum, 1, 2, 3, 4, 5, 7, 8, 9, 12, 13, 344.
early, appearance of, 223.
ectopic pregnancy, in, 229.
escape of, 78.
implantation of, 79.
impregnation of, 79.
Oxalic acid in purification of hands, 441.
Oxygen for postanaesthetic vomiting, 423.

Pack in abdomen, reflex vomiting from, 432.
Packing abdomen, 449.
uterus, 224.
Packs, uterine and vaginal, early removal of, 422.
Pain, abdominal, in pelvic peritonitis, 248, 253.

Pain, abdominal
with retained menses, 125.
with adenocarcinoma of body of uterus, 376.
of Fallopian tube, 384.
adenoma of uterus, 302.
appendicitis, 341.
carcinoma of cervix, 365, 373, 374.
of ovary, 387.
coccydynia, 405.
ectopic pregnancy, 229.
general peritonitis, 272.
herpes of vulva, 410.
hydrosalpinx, 339.
inversion of uterus, 186.
infections of fibromyomata, 326.
intermenstrual, 202, 208.
with leucoplakia vulvae, 411.
after ligation of nerves, 443.
mammary, in menstruation, 210.
menstrual, 75. (*See also* 'Dysmenorrhoea.')
with movable kidney, 404.
necrobiosis of fibromyomata, 320.
oedematous degeneration of fibromyomata, 320.
pelvic cellulitis, 267.
peritonitis, 430.
'red degeneration' of fibromyomata, 323.
referred, 65.
with rupture of ovarian cyst, 350.
salpingitis, 253.
sarcoma of body of uterus, 382.
sarcoma of cervix, 375.
torsion of fibromyomata, 325.
of ovarian cyst, 349.
tubal abortion, 232.
tuberculous cystitis, 402.
peritonitis, 341, 409.
tubo-ovarian cysts, 295.
Palpation, bimanual, 109.
of cervix, 112.
Fallopian tube, 113.
fundus of uterus, 112.
ovary, 113.
vagina, 109.
recto-vagino-abdominal, 111.
vagino-abdominal, 110.
Pampiniform plexus, 63.
varicosity of, 208.
Pancreas, cysts of, 342.
Panhysterectomy, 456.
with pelvic dissection, 457.
Papilloma in Fallopian tube, 332.
of vulva, 297.
Papillomata, implantation of, 470, 472.
in teratological ovarian hydrocele, 294.
Papillary carcinoma of ovary, 387.
Papillomatous cysts of broad ligament, **332**, 472.
Papillomatous cysts of ovary, **342**, 350, 470.
Papule, syphilitic, 259.
Paquelin's thermo-cautery, 373, 374, 428.
Paralytic distension of intestine, 428, 431.
Parametritis, 139, 267, 313.
Paraplegia, effect of, on parturition, 393.
Paravaginal incision of Schuchardt, 503.
Paroöphoron, 14, 53.
cysts of, 292.
papillary, 332.
Parotitis after abdominal operations, 434.
Parovarium, **52**, 285.
cysts of, **289**, 291, 338, 339, 342.
papillary, 332.
removal of, 471.
development of, 14.
tumours of, displacement of uterus by, 167, 169.
Pars intermedia, of bulbus vestibuli, 60.
uterina, of Fallopian tube, 44.
Partial inversion, 183, 189.
Parturition, effect of nervous diseases on, 393. (*See also* 'Labour.')
septic infection after, 264.
Pedicle, ligation of ovarian, 470.
needles, 456, 471.
Pedicles, material for ligation of, 443.
Pelvic abscess, 151, 234, 235, 251, 268, 269, 509.
adhesions in subinvolution, 227. (*See also* 'Adhesions.')
cellulitis, 139, 140, 151, 167, 263, 264, **267**, 270.
haematocele, *see* 'Haematocele, pelvic.'
inflammation with retroversion, 156.
neuralgia, constant current for, 512.
peritonitis, 247, 249, 264, 267, **269**, 270, 339.
dyspareunia with, 220.
platysma, 36.
plexus, 65.
retractor, 467.
Pelvimeter, 106.
Pelvis, bones of, 30.
brim of, 30.
drainage of, 138, 141.
false, 30.
fasciae of, 30.
muscles of, 30.
peritoneum of, 26.
true, 30.
Perforation of uterus, 114, 140, 325, 499.
Periappendiculo-tubal abscess, 274.
Perimetritis, 267.
Perineal body, 26, 56.

Perineorrhaphy, 422, **478**, 486, 488.
Perineum, anatomy of, 23.
central point of, 31, 34.
rupture of, 133, 136.
dissection of, 31.
laceration of, 133, 136, 176, 274.
operations for, 478.
Perithelioma, of body of uterus, 380, 381, **382**.
of ovary, 389.
Peritoneal currents, 79.
cysts, 292.
sac, 2.
Peritoneum, adhesions of, 407, 408, 409. (*See also* 'Adhesions.')
implantation of ovum on, 229.
of papillomata on, 332, 333, 342, 351.
infection of—in malignant disease of ovary, 389.
traumatic, 137, 140.
invasion of—in carcinoma of cervix, 370.
pelvic, 26.
Peritonitis, in carcinoma of cervix, 372.
with chronic constipation, 407.
foetal, 120.
general, 272.
pelvic, 220, 247, 249, 264, 267, **269**, 270, 339.
pneumococcal, 274.
septic, 427.
symptoms of, 430.
tuberculous, 277, 289, 341, 342, **408**.
vomiting in, 432.
Permanganate of potassium, sterilization of hands with, 441.
Pessary, Albert Smith, 153, 154, 157, 165.
insertion of, 159.
removal of, 160.
in congenital prolapse, 174.
cup and stem, 177.
Hodge, 153, 157.
insertion of, 159.
removal of, 160.
in retrodeviations with pelvic inflammation, 156.
ring, 179.
insertion of, 180.
removal of, 180.
supported ring, 177.
uterine stem, dangers of, 177.
Zwancke, dangers of, 180.
Phantom tumour, 342.
Phenacetin in dysmenorrhoea, 209.
Phenazonum in dysmenorrhoea, 204, 209.
Phlegmasia alba dolens, 264, 272.
Physiology of menstruation, 76.
of reproduction, 77.
Physostigmine salicylate for pseudo-ileus, 428.
Pigmentation, of abdomen in pregnancy, 83, 99.
of external genitals at puberty, 69.
Pigmentation, of mammary areola in pregnancy, 83.
Pin-hole os uteri, 120.
sterility with, 217.
Pirquet von, reaction of, 409.
Pituitary body (hypophysis), congenital disease of, sexual infantilism with, 118, 120, 194, 393.
disease of, secondary amenorrhoea with, 198.
sterility with, 216.
Pituitary body (infundibulum), disease of, 393.
extract of, in abortion, 224.
in Caesarean section, 469.
dosage, 213.
in hydatidiform mole, 240.
introduction of, 143.
in menopause, 212.
paralytic distension of intestines, 428, 429, 431.
ruptured uterus, 143.
shock, 426.
subinvolution, 227.
internal secretion of, 67, 77, 87.
influence on menstruation, 77.
on uterine contractions, 87.
Placenta, 79.
in abdominal pregnancy, 236.
abortion with disease of, 221.
retained, curettement for, 500.
Placental polyp, 224.
Plasmodi-trophoblast, 80.
Platysma, pelvic, 36.
Playfair's probe, 256.
Plexus (nervous), aortic, 65.
cavernous, 65.
hypogastric, 65, 425.
ovarian, 65.
pelvic, 65.
uterine, 65.
vaginal, 65.
(venous), haemorrhoidal, 63.
ovarian, 63.
pampiniform, 63.
varicocele of, 208.
uterine, 63.
vaginal, 63.
vesical, 63.
Plica gubernatrix, 16.
vascularis, 17.
Pneumococcus, 274.
Pneumonia, postoperative, 430.
Polar action of constant current, 511.
Polyp, uterine, diagnosis in, 223.
adenomatous, 302, 305.
adenofibromyomatous, 302.
fibromyomatous, 307, 310, 312, 313.
placental, 224.
removal of, 501, 502.
submucous, 325.
Polyuria at menopause, 211.
Polyvalent serum for acute infections, 432.
Portable operation table, 448.

Position, dorsal, 107.
'feet-down,' 447.
Fowler's, 138.
genufacial (genupectoral), **115**, 158, 159.
left latero-prone, 107.
lithotomy, 107, 134, 138, **474**.
modified dorsal, 110.
Sims', 107, 108.
Trendelenburg, 311, 314, 341, 342, 420, 425, **447**, 449, 451, 452, 453.
Postanaesthetic vomiting, 423.
Posterior commissure, 22, 23.
vaginal section, 509.
Postmenstrual pain, *see* 'Dysmenorrhoea.'
Postoperative complications, 422.
Pouch of Douglas, *see* 'Douglas, pouch of.'
Pozzi's operation for congenital stenosis of cervix, 495.
Precocious puberty, 191.
Pregnancy, abdominal, 229.
secondary, 231, 236.
before menstruation, 68, 77, 78.
calcium metabolism and, 406.
in carcinoma of cervix, 370.
chorionepithelioma following, 378.
cure for anteflexion, 150.
for dysmenorrhoea, 204.
painful breasts, 210.
cystitis in, 403.
in diagnosis, 313, 314, 342.
ectopic, *see* 'Ectopic pregnancy.'
endometrium in, 47.
fibromyomata with, 317, 320.
infection of, with, 325.
'red degeneration' of, with, 322.
after Gilliam's operation, 464.
haemorrhoids with, 406.
micturition, frequency of, in, 398.
myomectomy in, 461.
ovarian, 229, 389.
chorionepithelioma after, 389.
with ovarian tumours, 352.
prolapse of ovary following, 147.
of uterus following, 170.
retroversion with, 165.
sarcoma of cervix with, 375.
secondary amenorrhoea with, 198.
with desire for or fear of, 197.
signs and symptoms of, 81.
superponation in, 168.
in syphilis, 260.
tubal, 122, **229**, 509. (*See also* 'Ectopic pregnancy.')
chorionepithelioma following, 385.
uterine contractions in, 84, 86.
sound, danger in, 114.
in uterus bicornis, 122, 198, 228, 236.
varicose veins in, 228.
after ventrifixation, 164.
Premenstrual pain, *see* 'Dysmenorrhoea.'
Preparation of patient, for abdominal operations, 419.
general for operation, 415.
for vaginal operations, 421.
Prepuce, 22, 24.
Primordial ova, 68.
Procidentia uteri, 171.
Proctitis, 401.
Proctolysis, 438.
Proctoscope, 114.
Products of conception, retention of, 227.
Prolapsus uteri, **169**, 180.
in diagnosis, 119.
fibrosis uteri, 265.
operations for, 178.
abdominal, 462.
vaginal, 486, 497.
ovaries and tubes in, 148.
retroversion as early stage of, 157.
vaginae, 170, 181.
hypertrophy of cervix with, 119, 182.
Pronephros, 14.
Prooestrum, 77.
Protargol for gonorrhoea, 255, 256, 257.
Pruritus vulvae, 228, 397, 411, 521.
Pseudo-chorea, 192.
Pseudocyesis, 86, 97.
Pseudohermaphroditism, 130.
Pseudo-ileus, 428.
Pseudomucinous cystadenoma of ovary, 335.
Pseudo-tubo-ovarian cyst, 293.
Psychoses, 394.
postoperative, 395.
Puberty, 68.
affections of, 191.
changes in body of uterus at, 51.
delayed, 191.
precocious, 191.
Pudic veins, 63.
Puerperal inversion, 183.
retroversion, **154**, 157, 165.
Pulmonary thrombosis and embolism, 433, 434.
Pulse, in cystitis, 400.
in general peritonitis, 272.
infection of ovarian cysts, 349.
menstruation, 73.
pelvic peritonitis, 248.
peritonitis, 431.
secondary haemorrhage, 425.
septic endometritis, 264.
shock, 426.
thrombo-phlebitis, 270.
torsion of ovarian cyst, 349.
tubal abortion, 232.
Purification of hands, 441.
Purpura, menorrhagia in, 200.
Pyaemia, in carcinoma of cervix, 372.
in laceration of cervix during parturition, 139.

Pyaemia, in thrombo-phlebitis, 270, 271, 433.
Pyelitis, with cystitis, 400.
diagnosis in, **270.**
gonorrhoeal, 245.
Pyelo-nephritis, in carcinoma of cervix, 369.
Pyometra, in carcinoma of body of uterus, 313, 314, 377.
of cervix, 370.
Pyosalpinx, in carcinoma of Fallopian tube, 384.
diagnosis in, 158.
gonorrhoeal, 243, 251.
ovarian abscess with, 294.
posterior vaginal section for, 509.
salpingectomy for, 472.
sepsis after operation for, 429.
tuberculous, 277.
Pyuria, 402.

Quickening, 85.
Quinine enema for pseudo-ileus, 428.

Rami communicantes, 65.
Rape, 133, 137.
Rash, secondary of syphilis, 259.
enema, 424.
Ray fungus, 281.
Rectal saline infusions, 420, 426, 427, 433, **438.**
Rectocele, colporrhaphy for, 485.
Holden's operation for, 484.
prevention of, 137.
with prolapse of uterus, 170, 176.
prolapse of vagina, 181.
Rectum, examination of, 96, 114, 116.
fistulae of, *see* 'Fistulae.'
invasion of, in carcinoma of cervix, 369.
laceration of, 133.
pelvic inflammation spreading from, 156.
in posterior colporrhaphy, 488.
pressure on by ovarian cysts, 338.
relations of, 56, 57.
repair of, in perineal laceration, 481.
secondary malignant disease of, 114.
in vaginectomy, 494.
vicarious menstruation from, 210.
Recto-vagino-abdominal palpation, 111.
Recto-vaginal fistulae, 145.
repair of, 491.
'Red degeneration' of fibromyomata, 322.
Removal of Hodge and Albert Smith pessaries, 160.
Reproduction, physiology of, 77.
Retention, of products of conception, 227.
of urine, 165, 478.
Retraction, uterine, 87, 226, 469.
Retractor, Doyen's, 452.
Retractor
pelvic, 467.
ring, 452, 472.
vaginal, 493, 494.
Retroflexion and retroversion of uterus, 153.
abortion with, 221.
coccydynia with, 405.
congenital, 153, 158.
diagnosis of, 112.
dyspareunia with, 220.
genupectoral position in, 115, 158, 159.
of gravid uterus, **165**, 228, 403.
growths in anterior wall with, 151.
hysterotomy in, 204.
neuroses with, 395.
operations for, 162, 462, 463, 467.
prolapse of ovary with, 147, 148.
prolapse, stage of, 157, 171.
puerperal, 154, 165, 396.
replacement of, 158.
subinvolution in, 226.
traumatic, 157.
Retroperitoneal tumours, 152, 167.
Retroponation of uterus, 166.
Retroversion of uterus, *see* 'Retroflexion.'
'Rheumatism,' gonorrhoeal, 254.
Riehl's treatment of syphilis, 261.
Rigidity of abdomen, 95, 99, 101, 230, 248, 272, 430.
Rigors, in cystitis, 400.
in gonorrhoeal salpingitis, 254.
puerperal sepsis, 264.
thrombo-phlebitis, 270.
after venous infusions, 436.
Ring retractor, 452, 472.
Riva-Rocci sphygmomanometer, 427.
Rokitansky's tumour, 337.
Room, operation, choice of, 414.
Rosenmüller, organ of, 52.
Round ligament, *see* 'Ligament, round.'
Rubber drainage tubing, 449.
gloves, 96, 112, 223, 441.
Rupture of uterus, **141**, 164, 455, 456.
of Fallopian tube in ectopic pregnancy, 230.
in haematosalpinx, 193.

Sacralgia, in fibromyomata, 311.
in ovarian cyst, 338.
static current for, 513. (*See also* 'Backache.')
Saline infusions, methods of administration, 435.
rectal, 438.
after operation, 420, 433.
in shock, 426.
in septic peritonitis, 138, 431.
submammary, 426, 437.
in tubal abortion, 235.
venous, 435.
in secondary haemorrhage, 425.
shock, 426.
Salpingectomy, 472.

Salpingectomy
for adenocarcinoma of Fallopian tubes, 384.
adenoma of Fallopian tubes, 332.
ectopic pregnancy, 234.
pyosalpinx, 257.
Salpingitis, anteponation with, 152.
diagnosis of, 234, 313.
dyspareunia with, 220.
gonorrhoeal, acute, 246, **247**.
diagnosis in, 409.
symptoms, 253.
treatment, 255.
chronic, **249**, 251.
treatment, 257.
infected fibromyomata with, 326.
menorrhagia with, 257.
prolapse of tube with, 147.
puerperal, 267, **269**.
secondary amenorrhoea with, 196.
tuberculous, 276, 277, 342.
Salpingo-oöphorectomy, 474.
Sarcoma, of cervix, 375.
of body of uterus, 380.
Fallopian tube, 385.
ovary, 389.
uterus, complicating fibromyomata, 326.
diagnosis from fibromyoma, 308, 313.
carcinoma, 376.
inversion, producing, 189.
menorrhagia with, 199.
of vagina, 360.
vulva, 357.
Schimmelbusch mask, 417.
Schuchardt's paravaginal incision, 503.
Schüller, glands of, 61, 287.
Sciatica, with fibromyomata, 311.
with ovarian cysts, 338.
Scurvy, menorrhagia with, 200.
Sebaceous glands of labia, 60.
retention cysts of, 284.
Secondary abdominal pregnancy, 231, 236.
amenorrhoea, *see* 'Amenorrhoea.'
haemorrhage, 425.
Secretion, of breasts, 83, 84, 86.
of Fallopian tube, 79.
genital organs and tract, 66.
uterus, 87.
vagina, 241.
internal, of adrenals, 67, 77, 87.
of thyroid, 66, 77.
ovary, 13, 36, 66, 68, 69, 77, 195, 471.
pituitary, 67, 77, 87.
Sepsis, after abortion, 223, 224.
with carcinoma of cervix, 372.
uterine, subinvolution with, 226.
Septicaemia, in carcinoma of cervix, 372.
in lacerations of cervix, 139.
puerperal, 264.
Septic infection, by staphylococcus and streptococcus, 262.
by bacillus coli communis, 273.
pneumococcus, 275.
Serous cystadenoma of ovary, 337.
Serum, antitetanic, 280.
polyvalent, 432.
Sexual abstinence, menorrhagia with, 201.
excess, menorrhagia with, 201.
infantilism, 192.
with hypo-hypophysism, 194, 393.
hypothyroidism, 392.
sterility with, 216.
insanity at puberty, 192.
'Shivers' during menopause, 89.
Shock, 426.
Trendelenburg position in, 449.
in Wertheim's operation, 458.
mental, menorrhagia after, 201.
secondary amenorrhoea after, 197.
Sigmoid, inflammation spreading from, 156.
Sigmoiditis sinistra, 224, 401, 406.
Sigmoidoscope, 114.
Silk, **442**, 463, 468, 506.
Silkworm gut, **445**, 455.
Silver nitrate for cystitis, 400, 402.
Sims' position, 107, 108.
speculum, *see* 'Speculum.'
Skene's tubules, 287.
Skiagraphy, 116.
'Sling' operation, 165, 465.
Sloughing of vagina and vulva, 143, 145.
Smegma bacillus, 275.
Snare, wire, 501.
Soft sore, 262.
Sore throat in syphilis, 259.
Souffle, uterine, 85, 105, 237.
Sound, uterine, 114.
in anteflexion, 151.
congenital hypertrophy of cervix, 119.
inversion, 186, 187.
perforation of uterus by, 140.
in pregnancy, avoidance of, 114.
prolapse, 174.
retroflexion, 158.
Spasmodic dysmenorrhoea, 203.
Speculum, Cusco's bivalve, 107, 109.
Fergusson's, 107, 109, 374.
insertion of, 108.
Sims' duckbill, 107, 109, 474.
Sphincter ani, stretching of, 407.
vaginae, 31.
stretching and division of in vaginismus, 219.
Spina bifida, 122, 128, 171, 174.
Spirochaeta pallida, 258.
Stack's sterilizer, 440, 441.
Staphylococcus, **262**, 400, 402.
Static current, 513.
Stem, intrauterine, 141.

Stenosis of cervix, 120.
dysmenorrhoea with, 203.
operation for, 495.
Sterility, **216**, 522.
with anteflexion, 150.
fibromyomata, 317.
gonorrhoeal salpingitis, 244.
leucorrhoea, 139.
'membranous dysmenorrhoea,' 206.
pelvic inflammation and retroversion, 156.
permanent, 216.
with 'pinhole os,' 120.
retroflexion, 153.
superinvolution, 216.
temporary, 216.
causes of, 217.
with tuberculous salpingitis, 277.
Sterilization, 440.
of catgut, 443.
dressings, etc., 440.
gloves, 441.
hands, 441.
instruments, 415, 441.
silk, 443.
Sterilizers, 440.
Stomach, paralytic distension of, 429.
vicarious menstruation from, 210.
Strangulation of bowel, 432.
Streptococcus, **263**, 280, 400, 402.
as diplococcus, 275.
Stroma of endometrium, at climacteric, 91.
during menstruation, 71, 73.
of ovary, 38, 40.
in gonorrhoea, 253.
Strychnine in shock, avoidance of, 426.
Subcutaneous saline infusions, 436.
Subinvolution, 226.
constant current in, 512.
diagnosis in, 224.
Faradic current in, 513.
following hydatidiform mole, 240.
with lacerations of cervix, 139.
menorrhagia with, 199.
with prolapse, 170.
in puerperal retroflexion, 155.
Submammary saline infusions, 437.
Submucous fibromyomata uteri, 307.
Subserous fibromyomata uteri, 307, 312.
Superinvolution, 195, **227**.
sterility with, 216.
Superponation of uterus, 167.
Supravaginal hysterectomy, 459.
Surgeon's preparations for operation, 439.
'Suspensory ligaments,' of uterus, 31, 35.
Sutures, abdominal, 454.
materials for, 442.
Swedish exercises, for constipation, 407.
for enuresis, 399.
in gonorrhoea, 256.
menorrhagia, 200.
Weir-Mitchell treatment, 396.
Syncytial tissue, 80.
Syncytium, 80, 237, 378.
Syncytioma, *see* 'Chorionepithelioma.'
Syphilis, 258.
abortion in, 221.
pregnancy with, 260.
treatment of, 261.
ulceration of cervix in, 366.

Table, portable operation, 448.
Taenia echinococcus, 282.
Telangiectatic fibromyoma of uterus, 329.
Temperature, in carcinoma of cervix, 372.
in cystitis, 400.
general peritonitis, 272.
gonorrhoeal salpingitis, 254.
infection of ovarian cysts, 349.
menstruation, 73.
pelvic cellulitis, 267.
pyometra, 377.
'red degeneration' of fibromyomata, 323.
secondary haemorrhage, 425.
septic endometritis, 264.
shock, 426.
thrombo-phlebitis, 270.
tubal abortion, 232.
tuberculous salpingitis, 277.
Tenesmus with fibromyomata, 311.
Tents, 223.
Teratological ovarian hydrocele, 294.
Teratoma, cystic of ovary, 344, 390.
malignant of ovary, 390.
Teratomata, origin of, 11.
Testes, in hermaphrodites and pseudo-hermaphrodites, 129, 130, 131.
Tetanus, 280.
Theca folliculi, 40.
externa, 292.
interna, 292.
Thirst, after operation, 433.
Thrombo-phlebitis of pelvic veins, 267, **269**.
treatment of, 271.
Thrombosis, venous, in carcinoma of cervix, 372.
in fibromyomata, 322.
operation, after, 433.
subinvolution, with, 226.
Thyroid gland, administration of, for amenorrhoea, 194.
for enuresis, 399.
mammary pain, 210.
myxoedema, 392.
superinvolution, 227.
correlation between ovary and, 13, 66.
disease of, 392.
enlargement at menopause, 212.
at puberty, 69, 192.
influence of—on genital functions, 69, 77.
ovarian tumours resembling, 352.

Thyroid gland
primary amenorrhoea in disease of, 194.
secondary amenorrhoea in disease of, 198.
Tincture of iodine, internal uterine application of, 256.
Torsion of fibromyomata, 324.
of fibromyomatous uterus, 325.
ovarian cysts, **347**, 352, 387, 470.
Toxaemia, in carcinoma of cervix, 372.
in 'red degeneration' of fibromyomata, 323.
puerperal infection of fibromyomata, 326.
vomiting in, .
Trachelorrhaphy, 421, 422, **494**.
Trauma of uterus, 199.
Traumatic cysts of vagina, 286.
retroversion, 157.
Trendelenburg position, 311, 314, 341, 342, 420, 425, **447**, 449, 451, 452, 453.
Treves' kidney belt, 405.
Trophoblast, 79, 229, 230.
Tubal abortion, 229, 231.
mole, 230, 231.
pregnancy, 221, **229**, 509. (*See also* 'Ectopic pregnancy.')
vesicular mole, 237.
Tubercle, genital, 21.
Tubercles of Montgomery, 83.
Tuberculin, treatment by, 279.
Tuberculosis, 275.
of bladder, 401.
cervix, 275, **276**, 366.
Fallopian tubes, **276**, 278.
ovary, 277.
peritoneum, 289, **408**.
secondary amenorrhoea in, 198.
subinvolution in, 226.
treatment of, 278.
of uterus, 275, **276**, 456.
vagina, **275**, 278.
vulva, **275**, 278.
X-rays for, 514.
Tuberculous cystitis, 401, **408**.
peritonitis, 289.
salpingitis, 276.
ulcers of cervix, 366.
of vulva, 358.
Tubo-ovarian abscess, 251.
cyst, 250, **293**.
Tubules, genital, 14.
of Kobelt, 14, 54.
Tunica albuginea, 37, 208, 253.
'Turning,' rupture of uterus with, **142**.
Turpentine douches, 373.
enema, 420.
Typhoid bacillus, 349.
infection, 280, 398.

Ulcer, membranous of vulva, 273.
syphilitic, 259.
Umbilicus, hernia of, 98.
situation of, 107.
Unilateral hermaphroditism, 130.
Upward displacement of uterus, 167.
Urachus, cysts of, 342.
Uraemia, 432.
blood pressure in, 427.
in carcinoma of cervix, 372.
Ureter, 53.
compression of in cervical fibromyomata, 311.
development of, 20.
fistula of, operation on, 490.
in hysterectomy (abdominal), 457, 459.
(vaginal), 505, 508.
implication of in carcinoma of cervix, 372.
kinking of in movable kidney, 404.
relations of, 53.
in removal of vaginal growths, 491.
tuberculous infection of bladder *via*, 400.
Ureteral calculi, 146.
Uretero-vaginal fistulae, 145, 490, 508.
Urethra, 61.
anatomy, 24, 61.
caruncle of, 297, 300.
removal of, 478.
cysts of, 287.
development of, 20.
dilatation of, 115.
in epispadias, 128.
epithelioma of, 354, **356**.
epithelium of, 61.
in excision of vulval growths, 478.
glands of, 61.
in gonorrhoea, 244, 245.
infection of bladder *via*, 400.
nerves of, 65.
pressure on by vaginal growths, 300.
relations of, 56.
Urethritis, 399.
gonorrhoeal, 245.
Urethro-vaginal fistula, 145.
Urine, examination of, 107.
incontinence of, 129.
retention of, 165, 478.
Urogenital mesentery, 9, 13, 16, 17, 19, 118.
sinus, development of lower vagina from, 19, 124, 286, 360.
in marsupials, 6.
monotremes, 6.
persistent, 128.
pouch, 286.
Urotropine, 401, 403.
Uterus, 44.
abscess of, 264, 276.
absence of, 120, 123, 193.
accessory, 119.
adenofibromyoma of, 327.
adenoma of, 199, **300**, 500, 501.
adenomyoma of, 327.
anteflexion of, *see* 'Anteflexion of uterus.'
bacteriology of, 241.

Uterus
bicornis, 122.
abortion with, 221.
in carnivora, 15.
diagnosis from fibromyoma, 313
duplex, 122, 124.
in herniae, 182.
origin of, 18, 122.
pelvic diameter with, 106.
pregnancy in, 122, 198, 228, **236**.
unicollis, 122.
blood cysts of, 288.
supply of, 62.
body of, 44.
carcinoma of, *see* 'Carcinoma.'
glands of, 50.
injuries of, 140.
malignant disease of, 375. (*See also* 'Carcinoma.')
sarcoma of, 380.
carcinoma of, 189, 199, 429. (*See also* 'Carcinoma of body' and 'Carcinoma of cervix.')
cavity of, 45.
cervix, 45. (*See also* 'Cervix uteri.')
chorionepithelioma of, 378.
climacteric changes in, 91.
cystitis with malignant disease of, 404.
cysts of, 288.
deponation of, 169.
development of, 13.
didelphys, 18, 106, 121.
disease of, abortion with, 221.
menorrhagia with, 199.
sterility with, 216.
displacements of, **148**, 513.
dysmenorrhoea with, 206.
distension of, by clots, 203.
embryonic cysts of, 288.
enlargement of in pregnancy, 81.
in vesicular mole, 237.
epithelium of, 47, 73, 75.
evolution of, 3, 8.
excision of cornu in salpingectomy, 472.
fibrocystic tumours of, 341.
fibromyomata of, 306. (*See also* 'Fibromyomata of uterus.')
fibrosis of, 214, **265**, 305.
dysmenorrhoea with, 208.
flexions of, 148.
follicular cysts of, 288.
fundus of, 26, 44.
bimanual palpation of, 112.
laceration of, 142.
glands of, 67, 71, 73, 195, 265.
gonorrhoea of, 245.
haemorrhage from, *see* 'Haemorrhage, uterine,' 'Menorrhagia,' and 'Metrostaxis.'
hernia of, 182.
hydatid cysts of, 282.
impaction of, 165, 167.
Uterus
infantile, 121.
infections of, 114, 245, 264, 274, 276.
treatment of, 256, 266.
injury of, abortion from, 221.
innocent growths of, 300.
inspection of, 108.
inversion of, 183.
chronic, with sarcomatous polyp, 383.
diagnosis in, 114, 173, 314.
ovaries and tubes in, 148.
in removal of uterine polyps, 501.
involution of, 226.
isthmus of, 45.
lateral displacements of, 166.
lymphatics of, 63, 65.
male pseudohermaphroditism with, 130.
malformations of, 119.
abortion with, 221.
diagnosis in, 114.
malignant disease of, 361.
operations for, 458, 469, 502.
masculinus, 130.
in menstruation, 72.
mucous cysts of, 288.
neoplasms of, subinvolution with, 226.
oöphorectomy, changes in—after, 195.
os of, double, 122.
external, 26, 45.
internal, 45, 49.
pinhole, 120, 217.
perforation of, 114, 140, 325, 499.
postpartum infection of, 264.
prolapse of, **169**, 180. (*See also* 'Prolapsus uteri.')
puberty, changes in—at, 68.
removal of, 456, 502. (*See also* 'Hysterectomy.')
retroflexion of, *see* 'Retroflexion.'
retroponation of, 166.
retroversion of, *see* 'Retroflexion.'
rudimentary, 120.
rupture of, 141, 164, 455, 456.
sarcoma of, 375, **380**.
complicating fibromyomata, 326.
pregnancy, 375.
telangiectatic myoma, 330.
in diagnosis, 313, 376.
histology of, 308.
inversion with, 189.
menorrhagia with, 199.
secretion of, 67, 241.
sepsis of, *see* 'Infection of.'
septus, 122.
serous cysts of, 288.
sloughing of, 145.
stroma of, changes in—at climacteric, 91.
during menstruation, 71, 73.

Uterus
structure of, **46**, 52.
subinvolution of, 226. (*See also* 'Subinvolution.')
subseptus unicollis, 122.
superinvolution of, 195, 216, **227**.
superponation of, 167.
telangiectatic myoma of, 329.
in thrombo-phlebitis, 270.
tuberculosis of, 275, 276.
unicornis, 121.
ventrifixation of, 164, 395, 462.
versions of, 148.
Uterine arteries, arteriosclerosis of, 214.
artery, torn, 142.
colic, 203.
contractions, 86.
with fibromyomata, 310.
influence of calcium metabolism on, 70.
of ductless glands on, 89.
in labour, 86.
paraplegia, 393.
pregnancy, 84, 86.
moles, 236.
and non-uterine tumours, diagnosis between, 114.
plexus (nervous), 65.
(venous), 63.
polyps, removal of, 501.
retraction, 87.
souffle, 85, 105, 237.
sound, *see* 'Sound, uterine.'
vessels, 53, 54.
Utero-intestinal fistula, 145.
Utero-vesical fistula, 145.
pouch, 44.

Vaccine treatment for bacillus coli infection, 274.
for cystitis, 401.
sepsis, 432.
tuberculosis of genitalia, 279.
tuberculous cystitis, 402.
Vagina, 54.
absence of, 22.
upper two-thirds of, 120.
anatomy of, 26.
anterior column of, 26.
artificial, operation for, 126.
asepticity of, 241.
atresia of, **124**, 245.
lower end of, 127.
atrophy of, at menopause, 214.
bacillus, 67, 241.
bimanual palpation of, 109.
blood supply of, 62, 63.
carcinoma of, 360.
casts of, 144.
chorionepithelioma of, 361.
cleansing of, 96, 477.
climacteric changes in, 91.
colouration of, in pregnancy, 81.
complete removal of, 491.
crypts of, 57.
Vagina
cysts of, 285.
diagnosis in, 173.
removal of, 491.
defective, 219.
development of, 19.
developmental cysts of, 285.
direct palpation of, 109.
displacements of, 181.
double, 122.
epithelium of, 57.
evolution of, 6.
fascia of, 34, 56.
fibroma of, removal of, 491.
gonorrhoea of, 245.
hydatid cyst of, 282.
irrigation of, 136.
injuries of, 132.
innocent neoplasms of, 300.
inspection of, 107.
laceration of, 133, 137, 181, 274.
lateral, 124.
lymphatics of, 63.
in male pseudohermaphroditism, 130.
malignant disease of, 360.
during menstruation, 71.
nerves of, 65.
neoplasms of, removal of, 491.
operations involving, 456, 457.
on, 478.
plastic operation for new, 491.
posterior column of, 26.
prolapse of, 170.
relations of, 56.
sarcoma of, 360.
secretion of, 67, 241.
septate, 122, 123.
sloughing of, 143, 145.
sphincter of, 31.
structure of, 56.
syphilis of, 259.
traumatic cysts of, 286.
tuberculosis of, 275, 278.
tumours of, with prolapse, 170, 182.
with superponation, 169.
Vaginal Caesarean section, 502.
dilator, 219.
douching, 161.
in fibrosis uteri, 208.
with pessaries, 179.
in pregnancy, 165.
with procidentia, 178.
examination, **107**, 115, 116.
in virgins, 95.
fixation of uterus, 163.
hysterectomy, 502.
for arteriosclerosis, 214.
carcinoma of cervix, 373.
inversion, 187.
sarcoma of body of uterus, 383.
senile endometritis, 214.
sepsis, 266.
operations, 474.

Vaginal
orifice in kraurosis vulvae, 214.
plexus (nervous), 65.
(venous), 63.
retractors, 493, 494.
section, posterior, 509.
septa, laceration of, 123.
tube, 161.
Vaginectomy, 492.
Vaginismus, 219.
with neuroses, 395.
sterility in, 217.
Vagino-abdominal palpation, 110.
Van Gieson's stain, 308.
Varicocele, 308, 407, 408.
Varicose veins of vulva, 228.
Vascular changes with fibromyomata, 327.
Vein, dorsal of clitoris, 32.
femoral, 272.
thrombosis of, 433.
internal iliac, 271.
thrombosis of, 433.
saphena, 435.
median basilic, 435.
renal, 271.
Veins, enlarged superficial, 99.
hypogastric, thrombosis of, 269.
ovarian, 63.
ligation of, 408.
pressure on, 407.
thrombosis of, 269, 271.
pelvic, 63. (*See also* 'Plexus (venous).')
obstruction of, menorrhagia with, 201.
thrombosis of, 269.
pudic, 63.
varicose of labia majora, 132, 228.
Vena cava inferior, 271.
obstruction of, menorrhagia with, 201.
Venery, excessive, abortion with, 222.
Venous saline infusions, 426, 435.
thrombosis after operation, 433.
subinvolution with, 226.
Ventral hernia, 147.
Ventrifixation, 164, 395, **462**.
Ventrisuspension, 165, 174, **463**.
Versions of uterus, 148.
Vesical plexus, 63.
Vesico-vaginal fistula, 145.
repair of, 488.
Vesicular mole, 81, **236**, 378.
subinvolution after, 226.
tubal, 385.
Vestibule, anatomy of, 24.
in kraurosis vulvae, 214.
syphilis of, 259.
Vicarious menstruation, 210.
Violet colouration of vagina, 81, 108, 270.
Volsellum forceps, 114, 459.
Vomiting, in septic infections, 264.
postanaesthetic, 420, 423.
postoperative, 432.

Vulva, abnormalities of, 127.
absence of, 127.
actinomycosis of, 281.
adenocarcinoma of, 356.
anatomy of, 23.
atresia of, 475.
carcinoma of, 354.
cleansing of, 96.
climacteric changes in, 91.
cysts of, 283.
diphtheria of, 279.
double, 127.
elephantiasis of, 281.
examination of, 107.
glands of, 67.
gonorrhoea of, 244.
growths of, excision of, 476.
infection of, 272.
injuries of, 132.
innocent neoplasms of, 296.
laceration of, 475.
lipoma of, 296, 330.
lupus of, 275.
lymphatics of, 63.
malignant diseases of, 354.
melanoma of, 357.
nerves of, 65.
noma of, 398.
oedema of, 228.
operations on, 475.
pruritus of, 228, 397, 521.
rudimentary, 127.
sarcoma of, 357.
secretions of, 67.
septicity of, 241.
skin diseases of, 410.
syphilis of, 259.
tuberculosis of, 275, 278.
typhoid ulceration on, 280.
varicose veins of, 228.
Vulvitis, atresia after, 124.
dyspareunia in, 220.
gonorrhoeal, 244, 245.
Vulvo-vaginitis, gonorrhoeal, 243, 245.
treatment of, 255.
staphylococcal, 272.

Warts, gonorrhoeal, **244**, 297.
X-rays in, 514.
treatment of, 255.
of vulva, 297.
Weir-Mitchell treatment, 396.
Wertheim's culture medium, 243.
Wertheim's operation, 425, **457**.
'White line,' 33.
Wolffian body, 38, 283, 288, 334, 342, 386.
development of, 9, 14.
Wolffian ducts, 13, 20, 52, 130, 285, 288, 291.
development of, 9, 14.
cysts of, **285**, 289, 291.
mesentery, 16.
'Womb stones,' 324.
Wylie's operation, 164, **465**.

Xeroform, 422.
X-rays, action of, 514.
treatment by, 514.
of fibromyomata, 315, 514.
gonorrhoeal warts, 257, 514.
leucoplakia, 412, 514.
recurrent malignant disease, 514.
tuberculosis of vulva, 514.
X-rays, diagnosis by, in ectopic pregnancy, 116.
Xylol, sterilization of catgut in, 444.

Ziehl-Neelsen stain, 273, 275, 281.
Zona pellucida, 11.
Zwancke's pessary, 180.

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CONTENTS

	PAGE
ANATOMY	2
BACTERIOLOGY	17
BIOLOGY	12
CHEMISTRY	19
HEALTH AND HYGIENE	15
MEDICINE	2
MISCELLANEOUS	9
MONOGRAPHS ON BIOCHEMISTRY	24
OPTICS	18
PHOTOGRAPHY	18
PHYSIOLOGY	12
PROCEEDINGS OF THE ROYAL SOCIETY OF MEDICINE	11
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